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ACADEMY OF SCIENCE OF ST. LOUIS
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By Charles E. Burt and May Danheim Burt

An Aurora Observed in Missouri and Its Connection With Solar Activity

By Stuart L. O'Byrne

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Transactions of the
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Volume XXVIII, No. 1

A PRELIMINARY CHECK LIST OF THE LIZARDS OF SOUTH AMERICA

CHARLES E. BURT
and
MAY DANHEIM BURT

Issued August 1, 1933

A PRELIMINARY CHECK LIST OF THE LIZARDS OF SOUTH AMERICA

By

CHARLES E. BURT

and

MAY DANHEIM BURT

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INTRODUCTION

A CHECK LIST of South American lizards is much needed by students of herpetology, since there is no comprehensive reference work dealing with these forms. Boulenger's "Catalogue of the Lizards in the British Museum" (1885-1887) is very valuable for the species described prior to its appearance. This present list has been assembled upon the plan adopted by Stejneger and Barbour (1917 and 1923) for the two editions of their Check List of North American Amphibians and Reptiles, which in turn was patterned after the American Ornithologists Union Check List of Birds.

Much of the present check list has been prepared from bibliographic records copied from our recent contributions entitled "The South American Lizards in the Collection of the American Museum of Natural History" (Bull. Amer. Mus. Nat. Hist., Vol. 61, Art. 7, 1931, pp. 227-395, figs. 1-15), and "The South American Lizards in the Collection of the United States National Museum" (Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, pp. 1-52), respectively, but it is only through a continued systematic search and analysis of the literature that we have been able to bring the enterprise to completion. Although we are personally inclined to be conservative in our estimate and recognition of species, we offer this present work with the full realization that we have listed too many, rather than too few, of the named forms. In other words, it is perfectly clear to us that great systematic modifications of the present arrangements must ultimately be made by students of South American lizards. Thus, while certain genera are obviously full of synonyms, a number of new species and subspecies must undoubtedly remain to be found.

The arrangement used here is as follows: the families are given in phylogenetic or systematic sequence and the smaller groups are in alphabetical order. Well known synonymies are not included under the various forms for the citations of these are common in the general herpetological literature. However, a considerable number of new synonymies, which are proposed and supported by us in our contribution based upon the South American lizards in the collection of the American Museum of Natural History (or in other manuscripts) are listed below in their proper places; also, it may be stated that the present use of certain new generic and subspecific

combinations is likewise based upon our previous work. References to original descriptions and to a prominent use of the present arrangement (in case the two designations are not identical) are given for all except family names, the latter being formed automatically. Common names are not given, since in most cases none are known. The ranges have been, for the most part, only partially recorded and for this reason we have been inclined to make them general (for the present) rather than too specific. There is a wonderful opportunity for further field work and other research on South American lizards, since the precise distribution is scarcely known for even the most common species, and since very little has been published concerning their habitats and habits.

We wish to express here our grateful appreciation to Mr. Karl P. Schmidt, without whose help this contribution would surely have been much delayed, for criticism of the entire manuscript and for a considerable number of bibliographic references; and to Mrs. Helen T. Gaige for comments on the Gekkonidae and the Iguanidae, as well as for additional bibliographic aid. We are likewise grateful to the authorities of the many institutions in the United States that have allowed us free access to their collections of New World lizards and to their libraries, for it is only through such co-operation that the appearance of the more authentic and comprehensive contributions is made possible.

SYSTEMATIC LIST OF SOUTH AMERICAN LIZARDS

REPTILIA *(CLASS)*

SQUAMATA *(ORDER)*
SAURIA *(SUBORDER)*
GEKKONIDAE *(FAMILY)*

Genus **Coleodactylus**

PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 291 (type species, *meridionalis*)

Coleodactylus meridionalis (BOULENGER)

Sphaerodactylus meridionalis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 2, 1888, p. 40 (type locality, Inuarasse, Pernambuco, Brazil).

Coleodactylus meridionalis PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 29.

RANGE: Northeastern Brazil.

Coleodactylus zernyi WETTSTEIN

Coleodactylus zernyi WETTSTEIN, Zool. Anz., Vol. 76, 1928, p. 110, Fig. 1 (type locality, Taperinha, near Santarem, Brazil).

RANGE: Valley of the Amazon River, Brazil.

Genus **Gonatodes**

FITZINGER, Syst. Rept., 1843, p. 91 (type species, *albogularis*)

Gonatodes albogularis (DUMÉRIL AND BIBRON)

Gymnodactylus albogularis DUMÉRIL and BIBRON, Erp. Gén., Vol. 3, 1836, p. 415 (type locality, Martinique and Cuba).

Gonatodes albogularis BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 59.

RANGE: Dutch Leeward Islands and the adjacent mainland.

Gonatodes annularis BOULENGER

Gonatodes annularis BOULENGER, Proc. Zool. Soc. London, 1887, p. 154 (type locality, Maccasseema, on the Pomeroon River, British Guiana).

RANGE: The Guianas.

Gonatodes atricucullaris NOBLE

Gonatodes atricucullaris NOBLE, Ann. N. Y. Acad. Sci., Vol. 29, 1921, p. 135 (type locality, Bellavista, Peru).

RANGE: Northwestern Peru.

Gonatodes beebei NOBLE

Gonatodes beebei NOBLE, Zoologica, Vol. 3, 1923, p. 301 (type locality, Kartabo, British Guiana).

RANGE: British Guiana.

Gonatodes booni VAN LIDTH DE JEUDE

Gonatodes booni VAN LIDTH DE JEUDE, Notes Leyden Museum, Vol. 25, 1904, p. 87 (type locality, Coppename section, Dutch Guiana).

RANGE: Dutch Guiana.

Gonatodes caudiscutatus (GÜNTHER)

Gymnodactylus caudiscutatus GÜNTHER, Proc. Zool. Soc. London, 1859, p. 410 (type locality, western Ecuador).

Gonatodes caudiscutatus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 61.

RANGE: Colombia and Ecuador.

Gonatodes collaris GARMAN

Gonatodes collaris GARMAN, Bull. Essex Inst., Vol. 24, 1892, p. 83 (type locality, Wreck Bay, Chatham Island, Galapagos Archipelago).

RANGE: Chatham Island, Galapagos Archipelago.

Gonatodes concinnatus (O'SHAUGHNESSY)

Goniodactylus concinnatus O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 237, Pl. 33, Fig. 2 (type locality, Canelos, Ecuador).

Gonatodes concinnatus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 60.

RANGE: Ecuador.

Gonatodes ferrigineus COPE

Gonatodes ferrigineus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 102 (type locality, Trinidad).

RANGE: Trinidad.

Gonatodes fuscus (HALLOWELL)

Stenodactylus fuscus HALLOWELL, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 3, 1885, p. 33 (type locality, Nicaragua).

Gonatodes fuscus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 59.

RANGE: Colombia.

Gonatodes gaudichaudii (DUMÉRIL AND BIBRON)

Gymnodactylus gaudichaudii DUMÉRIL and BIBRON, Erp. Gén., Vol. 3, 1835, p. 413 (type locality, Coquimbo, Chile).

Gonatodes gaudichaudii WERNER, Zool. Jahrb., Suppl., Vol. 4, Fauna Chiliensis, pt. 1, 1898, p. 247.

RANGE: Northern and central Chile.

Gonatodes hasemani GRIFFIN

Gonatodes hasemani GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 304 (type locality, Villa Bella, near the Rio Beni, Bolivia).

RANGE: Bolivia.

Gonatodes humeralis (GUICHENOT)

Gymnodactylus humeralis GUICHENOT, in Castelnau, "Exp. de la Amer. du Sud, Zool.", Reptiles, 1855, p. 13 (type locality, Rio Ucayali, Mission de Sarayacu, Peru).

Gonatodes humeralis BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 62.

RANGE: Basin of the Upper Amazon.

Gonatodes ocellatus (GRAY)

Cyrtodactylus ocellatus GRAY, Synops. Reptilia, in Griffith, "Cuvier's Animal Kingdom", 1831, p. 51 (type locality, not given).

Gonatodes ocellatus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 60, Pl. 5, Fig. 1.

RANGE: Tobago, Trinidad, and the adjacent mainland.

Gonatodes oxycephalus WERNER

Gonatodes oxycephalus WERNER, Zool. Anz., Vol. 17, 1894, p. 413 (type locality, Ecuador).

RANGE: Ecuador.

Gonatodes vittatus (LICHTENSTEIN)

Gymnodactylus vittatus LICHTENSTEIN, Nomencl. Mus. Zool. Berol., 1856, p. 6 (type locality, La Guaira, Puerto Cabello, and Caracas, northern coast of Venezuela).

Gonatodes vittatus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 60.

RANGE: Dutch Leeward Islands, and northern South America from Colombia to Trinidad.

Genus **Gymnodactylus**

SPIX, Spec. Novae Lacert. Bras., 1825, p. 17 (type species, *geckoides*)

Gymnodactylus amarali BARBOUR

Gymnodactylus amarali BARBOUR, Proc. Biol. Soc. Wash., Vol. 38,

1925, p. 101 (type locality, Engenheiro Dodt, Santa Philomena, Upper Rio Parnahyba, Brazil).

RANGE: Brazil.

Gymnodactylus antillensis VAN LIDTH DE JEUDE

Gymnodactylus antillensis VAN LIDTH DE JEUDE, Notes Leyden Museum, Vol. 9, 1887, p. 129 (type locality, Curacao and Aruba, Dutch Leeward Islands).

RANGE: Dutch Leeward Islands.

Gymnodactylus borelli PERACCA

Gymnodactylus borelli PERACCA, Bull. Mus. Zool. Univ. Torino, Vol. 12, 1897, No. 274, p. 2 (type locality, Salta, Argentina).

RANGE: Northern Argentina.

Gymnodactylus dorbignyi DUMÉRIL and BIBRON

Gymnodactylus dorbignyi DUMÉRIL and BIBRON, Erp. Gén., Vol. 3, 1836, p. 418 (type locality, Province of Laguna and Valparaiso, in Chile).

RANGE: Chile.

Gymnodactylus geckoides SPIX

Gymnodactylus geckoides SPIX, Spec. Novae Lacert. Bras., 1825, p. 17 (type locality, Bahia, Brazil).

RANGE: Brazil.

Gymnodactylus horridus BURMEISTER

Gymnodactylus horridus BURMEISTER, Reise La Plata, Vol. 2, 1861, p. 522 (type locality, Mendoza, Argentina).

RANGE: Argentina and Bolivia.

Gymnodactylus mattogrossoensis BERG

Gymnodactylus mattogrossoensis BERG, Ann. Mus. Buenos Aires, Vol. 4, 1895, p. 191 (type locality, Mattogrosso, Brazil).

RANGE: Brazil and Argentina.

Genus **Hemidactylus**

OKEN, ISIS, 1817, p. 1183 (type species, *tuberculeaux=mabouia*)

Hemidactylus leightoni BOULENGER

Hemidactylus leightoni BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 19 (type locality, Honda, Magdalena River, Colombia).

RANGE: Colombia.

Hemidactylus mabouia (MOREAU DE JONNÉS)

Gecko mabouia MOREAU DE JONNÉS, Bull. Soc. Philom., 1818, p. 138 (type locality, Antilles and adjacent mainland).

Hemidactylus mabouia GRAY, Cat. Liz. British Mus., 1845, p. 154.
RANGE: Northeastern South America and Venezuela.

Hemidactylus peruvianus WIEGMANN

Hemidactylus peruvianus WIEGMANN, Nova Acta Acad. Leop.-Carol., Vol. 17, Pt. 1, 1835, p. 240 (type locality, Tacna, Peru).
RANGE: Peru.

Genus **Homonota**

GRAY, Cat. Liz. British Mus., 1845, p. 171 (type species, *gaudichaudii*=*darwinii*)

Homonota darwinii BOULENGER

Homonota darwinii BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 21 (new name for *Gymnodactylus gaudichaudii* Bell, preoccupied by *G. gaudichaudii* Duméril and Bibron).
RANGE: Argentina.

Homonota whitii BOULENGER

Homonota whitii BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 22 (type locality, Cordoba, Argentina).
RANGE: Argentina.

Genus **Lepidoblepharis**

PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, 1897, No. 300, p. 1 (type species, *festae*)

Lepidoblepharis buchwaldi WERNER

Lepidoblepharis buchwaldi WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, 1910, p. 8 (type locality, Hacienda Clementina, Babahoyo, Ecuador).
RANGE: Ecuador.

Lepidoblepharis festae PERACCA

Lepidoblepharis festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, 1897, No. 300, p. 2 (type locality, San José de Cuchipamba, Ecuador).
RANGE: Ecuador.

Lepidoblepharis intremedius BOULENGER

Lepidoblepharis intermedius BOULENGER, Proc. Zool. Soc. London, 1914, p. 814 (type locality, Anda Goya, at the junction of the Rio Condoto and San Juan, southern Colombia).
RANGE: Colombia.

Lepidoblepharis lunulatus ROUX

Lepidoblepharis lunulatus ROUX, Verhandl. Naturf. Ges. Basel, Vol. 38, 1927, p. 252 (type locality, El Mene, Province of Falcon, Venezuela).

RANGE: Venezuela.

Lepidoblepharis peraccae BOULENGER

Lepidoblepharis peraccae BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 1, 1908, p. 111 (type locality, Los Mangos, southwestern Colombia).

RANGE: Colombia.

Lepidoblepharis ruthveni PARKER

Lepidoblepharis ruthveni PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 295 (type locality, Chimbo, Ecuador).

RANGE: Ecuador.

Lepidoblepharis sanctae-martae (RUTHVEN)

Lathrogecko sanctae-martae RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 21, 1916, p. 2 (type locality, Fundacion, Colombia).

Lepidoblepharis sanctae-martae PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 294.

RANGE: Colombia.

Lepidoblepharis xanthostigma (NOBLE)

Lathrogecko xanthostigma NOBLE, Proc. Biol. Soc. Wash., Vol. 29, 1926, p. 87 (type locality, Zent, near Puerto Limon, Costa Rica).

Lathrogecko microlepis NOBLE, Amer. Mus. Novitates, No. 88, 1923, p. 2 (Rio Quesado, Atrato River region, Colombia).

Lepidoblepharis xanthostigma PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 295.

RANGE: Colombia, northward into Central America.

Genus **Phyllodactylus**

GRAY, Spicileg. Zool., 1830, p. 3 (type species, *pulcher*)

Phyllodactylus abrupteseriatus WERNER

Phyllodactylus abrupteseriatus WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 30, 1912, p. 4 (type locality, probably Brazil).

RANGE: Ecuador.

Phyllodactylus baessleri WERNER

Phyllodactylus baessleri WERNER, Abhandl. u. Ber. Zool. Anthr.-

Ethn. Mus. Dresden, Vol. 9, No. 2, 1901, p. 2 (type locality, Chanchamayo, Peru).

RANGE: Peru.

Phyllodactylus barringtonensis VAN DENBURGH

Phyllodactylus barringtonensis VAN DENBURGH, Proc. Calif. Acad. Sci., Ser. 4, Vol. 1, 1912, p. 418 (type locality, Barrington Island, Galapagos Archipelago).

RANGE: Barrington Island, Galapagos Archipelago.

Phyllodactylus baurii GARMAN

Phyllodactylus baurii GARMAN, Bull. Essex Inst., Vol. 24, 1892, p. 10 (type locality, Las Cuevas, Charles Island, Galapagos Archipelago).

RANGE: Hood, Gardner-near-Hood, Charles, Gardner-near-Charles, Champion, and Enderby Islands, Galapagos Archipelago.

Phyllodactylus galapagoensis PETERS

Phyllodactylus galapagoensis PETERS, Monatsb. Akad. Wiss. Berlin, 1869, p. 720 (type locality, Galapagos Archipelago).

RANGE: Duncan, Daphne, Albermarle, Indefatigable, James, Cowley, and Brattle Islands, Galapagos Archipelago.

Phyllodactylus gerrhopygus (WIEGMANN)

Diplodactylus gerrhopygus WIEGMANN, Nova Acta Acad. Caes. Leop.-Carol., Vol. 27, Pt. 1, 1835, p. 242 (type locality, Chile).

Phyllodactylus gerrhopygus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 95.

RANGE: Chile and Peru.

Phyllodactylus gilberti HELLER

Phyllodactylus gilberti HELLER, Proc. Wash. Acad. Sci., Vol. 5, 1903, p. 61 (type locality, Wenman Island, Galapagos Archipelago).

RANGE: Wenman Island, Galapagos Archipelago.

Phyllodactylus guayaquilensis WERNER

Phyllodactylus quayaquilensis WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, 1910, Pt. 2, p. 4 (type locality, Guayaquil, Ecuador).

RANGE: Eucador.

Phyllodactylus heterurus WERNER

Phyllodactylus heterurus WERNER, in Burger, "Estudios sobre Reptiles Chilenos", An. Univ. Chile, Santiago, 1907, p. 3 (type locality, Oasis of Pica, Tarpaca Desert, Chile).

RANGE: Chile.

Phyllodactylus inaequalis COPE

Phyllodactylus inaequalis COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 174 (type locality, Pacasmayo, Peru).

RANGE: Peru.

Phyllodactylus leei COPE

Phyllodactylus leei COPE, Proc. U. S. Nat. Mus., Vol. 12, 1889, p. 145 (type locality, Chatham Island, Galapagos Archipelago).

RANGE: Chatham Island, Galapagos Archipelago.

Phyllodactylus lepidopygus (TSCHUDI)

Dyplodactylus lepidopygus TSCHUDI, Fauna Peruana, Herpet., 1845, p. 38 (type locality, Peru).

Phyllodactylus lepidopygus ROUX, Rev. Suisse Zool., Vol. 15, 1907, p. 294.

RANGE: Peru.

Phyllodactylus magister NOBLE

Phyllodactylus magister NOBLE, Occas. Pap. Boston Soc. Nat. Hist., Vol. 5, 1924, p. 110 (type locality, near Perico, Valley of the Rio Chinchipe, Peru).

RANGE: Northwestern Peru.

Phyllodactylus mentalis WERNER

Phyllodactylus mentalis WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, 1910, p. 5 (type locality, unknown).

RANGE: Probably South American.

Phyllodactylus microphyllus COPE

Phyllodactylus microphyllus COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 175 (type locality, Valley of the Jequetepeque, Peru).

RANGE: Peru.

Phyllodactylus nigrofasciatus COPE

Phyllodactylus nigrofasciatus COPE, Proc. Amer. Philos. Soc., Vol. 17, 1887, p. 36 (type locality, Chimbote Valley, Peru).

RANGE: Peru.

Phyllodactylus phacophorus (TSCHUDI)

Discodactylus phacophorus TSCHUDI, Fauna Peruana, Herpet., 1845, p. 38 (type locality, Peru).

Phyllodactylus phacophorus BOULENGER, Cat. Liz. British Mus., Vol. 1, 1885, p. 84.

RANGE: Peru.

Phyllodactylus pulcher GRAY

Phyllodactylus pulcher GRAY, Spicileg. Zool., 1830, p. 3 (type locality, Tropical America).

RANGE: Dutch Leeward Islands.

Phyllodactylus reissii PETERS

Phyllodactylus reissii PETERS, Monatsb. Akad. Wiss. Berlin, 1862, p. 626 (type locality, Guayaquil, Ecuador).

RANGE: Uncertain, claimed recently to be the Dutch Leeward Islands, but listed by Boulenger as Ecuador and Peru.

Phyllodactylus spatulatus COPE

Phyllodactylus spatulatus COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 176 (type locality, Barbados).

RANGE: Aruba, Dutch Leeward Islands, and Barbados Island, West Indies.

Phyllodactylus tuberculosus WIEGMANN

Phyllodactylus tuberculosus WIEGMANN, Nova Acta Acad. Caes. Leop.-Carol., Vol. 17, Pt. 1, 1835, p. 241 (type locality, California).

RANGE: Coast of western South America, and Chatham Island, Galapagos Archipelago.

Phyllodactylus variegatus WERNER

Phyllodactylus variegatus WERNER, Abhandl. u. Ber. Zool. Anthr.-Ethn. Mus. Dresden, Vol. 9, No. 2, 1901, p. 2 (type locality, Lima and Chanchamayo, Peru).

RANGE: Peru.

Phyllodactylus ventralis O'SHAUGHNESSY

Phyllodactylus ventralis O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 4, Vol. 16, 1875, p. 263 (Jamaica, no doubt in error).

RANGE: Colombia, northward into Central America.

Genus **Phyllopezus**

PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 415
(type species, *goyazensis*=*pollicaris*)

Phyllopezus pollicaris (SPIX*)

Thecadactylus pollicaris SPIX, Spec. Nov. Lacert. Bros., 1825, p. 17 (type locality, Brazil).

Phyllopezus goyazensis PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 415 (type locality, Goyaz, Brazil).

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*Synonymy after Brongersma and Müller (unpublished).

Phyllopezus przewalskii KOSLOWSKY, Revista Mus. La Plata, Vol. 6, 1895, p. 231 (type locality, Descalvados, District of San Luis de Caceres, Matto Grosso, Brazil).

RANGE: Brazil and Paraguay.

Genus **Pseudogonatodes**

RUTHVEN, Occas. Pap, Mus. Zool. Univ. Mich., No. 19, 1915, p. 1 (type species, *furvus*)

Pseudogonatodes barbouri (NOBLE)

Lepidoblepharis barbouri NOBLE, Ann. N. Y. Acad. Sci., Vol. 29, 1921, p. 133 (type locality, Perico, Peru).

Pseudogonatodes barbouri PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 298.

RANGE: Northwestern Peru.

Pseudogonatodes furvus RUTHVEN

Pseudogonatodes furvus RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 19, 1915, p. 1 (type locality, San Lorenzo, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Genus **Sphaerodactylus**

WAGLER, Syst. Amph., 1830, p. 143 (type species, *sputator*)

Sphaerodactylus amazonicus ANDERSSON

Sphaerodactylus amazonicus ANDERSSON, Arkiv f. Zool., Vol. 11, No. 16, 1918, p. 1 (type locality, Amazonas, Manaos, Lago Poraquecuare, Brazil).

RANGE: Brazil.

Sphaerodactylus fantasticus DUMÉRIL and BIBRON

Sphaerodactylus fantasticus DUMÉRIL and BIBRON, Erp. Gén., Vol. 3, 1836, p. 406 (type locality, Martinique).

RANGE: Northern Venezuela (according to Boulenger).

Sphaerodactylus lineolatus LICHTENSTEIN

Sphaerodactylus lineolatus LICHTENSTEIN, Nomencl. Mus. Zool. Berol., 1854, p. 6 (type locality, Veragua, Panama).

RANGE: Northwestern Colombia.

Sphaerodactylus molei BOETTGER

Sphaerodactylus molei BOETTGER, Journ. Trinidad Field Nat. Club, Vol. 2, 1894, p. 80 (type locality, Caparo, Trinidad).

Sphaerodactylus buergeri WERNER, Verhandl. zool.-bot. Ges. Wien, Vol. 50, 1900, p. 264 (type locality, Port of Spain, Trinidad).

RANGE: Trinidad and the mainland of northeastern South America.

Sphaerodactylus scapularis BOULENGER

Sphaerodactylus scapularis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 9, 1902, p. 54 (type locality, St. Javier, northwestern Ecuador).

RANGE: Ecuador and Colombia.

Sphaerodactylus venezuelanus ROUX

Sphaerodactylus venezuelanus ROUX, Verhandl. Naturf. Ges. Basel, Vol. 38, 1927, p. 254 (type locality, El Mene, Province of Falcon, Venezuela).

RANGE: Venezuela.

Genus **Thecadactylus**

OKEN, Isis, 1817, p. 1183 (type species, *laevis=rapicaudus*)

Thecadactylus rapicaudus (HOUTTUYN)

Gekko rapicauda HOUTTUYN, Verhandl. Zeeuwsch. Genoot. Wet. Vlissingen, Vol. 9, 1782, p. 323 (type locality, American Islands).

RANGE: West Indies, mainland of South America with exception of southern part, Dutch Leeward Islands, and Central America.

IGUANIDAE (*FAMILY*)

Genus **Amblyrhynchus**

BELL, Zool. Journ., Vol. 2, 1825, p. 206 (type species, *cristatus*)

Amblyrhynchus cristatus BELL

Amblyrhynchus cristatus BELL, Zool. Journ., Vol. 2, 1825, p. 206 (type locality, "Mexico").

RANGE: Galapagos Archipelago.

Genus **Anisolepis**

BOULENGER, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 16, 1885, p. 85 (type species, *iheringii=undulatus*)

Anisolepis grillii BOULENGER

Anisolepis grillii BOULENGER, Ann. Mus. Civ. Stor. Nat. Genova, Ser. 2, Vol. 10, 1891, p. 909 (type locality, Palmeira, Province of Parana, Brazil).

RANGE: Southern Brazil.

Anisolepis lionotus WERNER

Anisolepis lionotus WERNER, Verhandl. k.k. zool.-bot. Ges. Wien, Vol. 46, 1896, p. 470 (type locality, Blumenau, Province of Santa Catharina, Brazil).

RANGE: Southern Brazil.

Anisolepis undulatus (WIEGMANN)

Laemanctus undulatus WIEGMANN, Herpetologia Mexicana, 1834, p. 46 (type locality, Brazil).

Enyalius undulatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 121.

Anisolepis iheringii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 16, 1885, p. 85 (type locality, San Lorenzo, Rio Grande do Sul, Brazil).

Anisolepis bruchi KOSLOWSKY, Revista Mus. La Plata, Vol. 6, 1895, p. 417 (type locality, Punta Lara, Argentina).

Anisolepis undulatus BOULENGER, Ann. Mus. Civ. Stor. Nat. Genova, Ser. 2, Vol. 10, p. 909.

RANGE: Southern Brazil, northern Argentina, and Uruguay, eastern South America.

Genus **Anolis**

DAUDIN, Hist. Nat. des Reptiles, Vol. 4, 1802, p. 17 (type species, *bullaris=carolinensis*)

Anolis aeneus GRAY

Anolis aeneus GRAY, Ann. and Mag. Nat. Hist., Vol. 5, 1840, p. 114 (type locality, unknown).

Anolis alligator BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 31 (part).

RANGE: Tobago, Trinidad, and the mainland of northeastern South America to Venezuela.

Anolis aequatorialis WERNER

Anolis aequatorialis WERNER, Zool. Anz., Vol. 17, 1894, p. 343 (type locality, Ecuador).

RANGE: Ecuador.

Anolis agassizi STEJNEGER

Anolis agassizi STEJNEGER, Bull. Mus. Comp. Zool., Vol. 36, 1900, p. 161 (type locality, Malpelo Island, Pacific Ocean, off Colombia).

RANGE: Malpelo Island.

Anolis albi BARBOUR

Anolis albi BARBOUR, Proc. N. Eng. Zool. Club, Vol. 12, 1932, p. 101 (type locality, Andagoya, Choco, western Colombia).

RANGE: Western Colombia.

Anolis andianus BOULENGER

Anolis andianus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 60 (type locality, Milligalli, Ecuador).

RANGE: Ecuador.

Anolis apollinaris BOULENGER

Anolis apollinaris BOULENGER, Proc. Zool. Soc. London, 1919, p. 79 (type locality, Bogota, Colombia).

RANGE: Colombia, and northern Ecuador.

Anolis binotatus PETERS

Anolis binotatus PETERS, Monatsb. Akad. Wiss. Berlin, 1863, p. 140 (type locality, Guayaquil, Ecuador).

RANGE: Western Ecuador, northward into Central America.

Anolis biporcatus (WIEGMANN)

Dactyloa biporcata WIEGMANN, Herpetologia Mexicana, 1834, p. 47 (type locality, unknown).

Anolis biporcatus BOCOURT, Miss. Sci. Mex. et Amer. Cent., 1874, p. 98.

RANGE: Western Ecuador, northward into Central America.

Anolis bitectus COPE

Anolis bitectus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 171 (type locality, Western Ecuador).

RANGE: Ecuador.

Anolis bocourtii COPE

Anolis bocourtii COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 167 (type locality, Nauta, northern Peru).

RANGE: Region of boundary between Ecuador and Peru.

Anolis boettgeri BOULENGER

Anolis boettgeri BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 19 (type locality, Huancabamba, Peru).

RANGE: Peru.

Anolis bombiceps COPE

Anolis bombiceps COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 168 (type locality, Nauta, northern Peru).

RANGE: Northeastern Peru.

Anolis bonairensis RUTHVEN

Anolis bonairensis RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 143, 1923, p. 4 (type locality, Seroe Grandi, 4½ kilometers northeast of Kralendijk, Bonaire, Dutch Leeward Islands).

RANGE: Bonaire, Dutch Leeward Islands.

Anolis boulengeri O'SHAUGHNESSY

Anolis boulengeri O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 242 (type locality, Canelos, Ecuador).

RANGE: Ecuador.

Anolis breviceps BOULENGER

Anolis breviceps BOULENGER, Proc. Zool. Soc. London, 1913, p. 1031 (type locality, Pena Lisa, Condoto, in the Choco, Colombia).

RANGE: Colombia.

Anolis bruneti THOMINOT

Anolis bruneti THOMINOT, Bull. Soc. Philom., Ser. 7, Vol. 11, 1887, p. 184 (type locality, Brazil).

RANGE: Brazil.

Anolis buckleyi O'SHAUGHNESSY

Anolis buckleyi O'SHAUGHNESSY, Proc. Zool. Soc. London, 1880, p. 492 (type locality, Canelos, Ecuador).

RANGE: Ecuador.

Anolis chloris BOULENGER

Anolis chloris BOULENGER, Proc. Zool. Soc. London, 1898, p. 110 (type locality, Paramba, Ecuador).

RANGE: Ecuador.

Anolis chrysolepis DUMÉRIL and BIBRON

Anolis chrysolepis DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 94 (type locality, Guiana).

RANGE: Trinidad, Brazil, the Guianas, and Venezuela.

Anolis copei BOCOURT

Anolis copei BOCOURT, Miss. sci. Mex. et Amer. cent., 1874, p. 77, Pl. 15, Fig. 10a (type locality, Santa Rosa de Pansos, Guatemala).

RANGE: Western Ecuador, northward into Central America.

Anolis eulaemus BOULENGER

Anolis eulaemus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8,

Vol. 2, 1908, p. 516 (type locality, Pavas, southwestern Colombia).

RANGE: Southwestern Colombia.

Anolis fasciatus BOULENGER

Anolis fasciatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 59 (type locality, Guayaquil, Ecuador).

Anolis elegans BOULENGER, Proc. Zool. Soc. London, 1898, p. 109 (type locality, Chimbo, Ecuador).

RANGE: Ecuador.

Anolis festae PERACCA

Anolis festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 19, No. 465, 1904, p. 4 (type locality, Balzar, Ecuador).

RANGE: Ecuador.

Anolis fraseri GÜNTHER

Anolis fraseri GÜNTHER, Proc. Zool. Soc. London, 1859, p. 407 (type locality, western Ecuador).

RANGE: Ecuador.

Anolis frenatus COPE

Anolis frenatus COPE, Sci. Bull. Phila. Museums, Vol. 1, 1899, p. 6 (type locality, probably near Bogota, Colombia).

RANGE: Colombia.

Anolis fusco-auratus D'ORBIGNY

Anolis fusco-auratus D'ORBIGNY, in Duméril and Bibron, Erp. Gén., Vol. 4, 1837, p. 110 (type locality, Chile).

Anolis antonii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 2, 1908, p. 517 (type locality, San Antonio, Colombia).

RANGE: Chile (?) and northern South America.

Anolis gaigei RUTHVEN

Anolis gaigei RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 32, 1916, p. 4 (type locality, San Lorenzo, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Anolis gemmosus O'SHAUGHNESSY

Anolis gemmosus O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 4, Vol. 15, 1875, p. 280 (type locality, unknown).

RANGE: Ecuador.

Anolis godeti ROUX

Anolis godeti ROUX, Zool. Anz., Vol. 31, 1907, p. 764 (type locality, unknown).

RANGE: Probably South American; said to be related to *lineatus* of the Dutch Leeward Islands.

Anolis gorgonae BARBOUR

Anolis gorgonae BARBOUR, Bull. Mus. Comp. Zool., Vol. 46, 1905, p. 66 (type locality, Gorgona Island, Colombia).

RANGE: Gorgona Island, Gulf of Panama.

Anolis gracilipes BOULENGER

Anolis gracilipes BOULENGER, Proc. Zool. Soc. London, 1898, p. 112 (type locality, Paramba, Ecuador).

RANGE: Ecuador.

Anolis granuliceps BOULENGER

Anolis granuliceps BOULENGER, Proc. Zool. Soc. London, 1898, p. 111 (type locality, Paramba, Ecuador).

RANGE: Ecuador.

Anolis holotropis BOULENGER

Anolis holotropis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 15, 1895, p. 522 (type locality, Matto Grosso, Brazil).

RANGE: Brazil.

Anolis incompertus incompertus BARBOUR

Anolis incompertus incompertus BARBOUR, Proc. N. Eng. Zool. Club, Vol. 12, 1932, p. 99 (type locality, Villavicencio, Territory of San Martin, Colombia).

RANGE: South-central Colombia.

Anolis incompertus nicefori BARBOUR

Anolis incompertus nicefori BARBOUR, Proc. N. Eng. Zool. Club, Vol. 12, 1932, p. 100 (type locality, Humbo, Department of Boyaca, Colombia).

RANGE: North-central Colombia.

Anolis irregularis WERNER

Anolis irregularis WERNER, Verhandl. k.k. zool.-bot. Ges. Wien, Vol. 51, 1901, p. 594 (type locality, unknown).

RANGE: Probably South American.

Anolis jacare BOULENGER

Anolis jacare BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 11, 1903, p. 482 (type locality, Merida, Venezuela).

RANGE: Venezuela and eastern Colombia.

Anolis kugleri ROUX

Anolis kugleri ROUX, Verhandl. Naturf. Ges. Basel, Vol. 40, Pt. 2, 1929, p. 29 (type locality, El Mene, District of Acosta, Province of Falcon, Venezuela).

RANGE: Venezuela.

Anolis laevis COPE

Anolis laevis COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 165 (type locality, Huallaga River, Peru).

RANGE: Peru.

Anolis latifrons BERTHOLD

Anolis latifrons BERTHOLD, Mitt. Zool. Mus. Göttingen, Vol. 1, 1846, p. 11 (type locality, Province of Popayan, Colombia).

RANGE: Colombia, northward into Central America.

Anolis lemniscatus BOULENGER

Anolis lemniscatus BOULENGER, Proc. Zool. Soc. London, 1898, p. 113 (type locality, Chimbo, Ecuador).

RANGE: Ecuador.

Anolis lentiginosus O'SHAUGHNESSY

Anolis lentiginosus O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 4, Vol. 15, 1875, p. 279 (type locality, Surinam).

RANGE: The Guianas.

Anolis leptoscelis BOULENGER

Anolis leptoscelis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 92 (type locality, Pebas, northeastern Peru).

Anolis macropus COPE, Proc. Amer. Philos. Soc., Vol. 23, 1885, p. 101 (type locality, Pebas, northeastern Peru).

RANGE: Northeastern Peru.

Anolis lindeni RUTHVEN

Anolis lindeni RUTHVEN, Proc. Biol. Soc. Wash., Vol. 25, 1912, p. 163 (type locality, Santarem, Brazil).

RANGE: Brazil.

Anolis lineatus DAUDIN

Anolis lineatus DAUDIN, Hist. Nat. des Reptiles, Vol. 4, 1802, p. 66 (type locality, South America).

RANGE: Dutch Leeward Islands.

Anolis lionotus COPE

Anolis lionotus COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 210 (type locality, Cocuyas de Veraguas, Colombia).

RANGE: Colombia.

Anolis longicrus ROUX

Anolis longicrus ROUX, Zool. Anz., Vol. 31, 1907, p. 763 (type locality, Surinam).

RANGE: The Guianas.

Anolis longipes COPE

Anolis longipes COPE, Proc. Amer. Philos. Soc., Vol. 31, 1893, p. 343 (type locality, Palamar, Costa Rica).

Anolis purpurescens COPE, Bull. Phila. Museums, Vol. 1, 1899, p. 7 (type locality, Colombia).

RANGE: Colombia, northward into Central America.

Anolis macrolepis BOULENGER

Anolis macrolepis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 21 (type locality, Novita, Rio Tamana, Choco, southwestern Colombia).

RANGE: Southwestern Colombia.

Anolis maculiventris BOULENGER

Anolis maculiventris BOULENGER, Proc. Zool. Soc. London, 1898, p. 111 (type locality, Paramba, Ecuador).

RANGE: Ecuador.

Anolis mariarum BARBOUR

Anolis mariarum BARBOUR, Proc. N. Eng. Zool. Club, Vol. 12, 1932, p. 100 (type locality, Medellin, Department of Antioquia, Colombia).

RANGE: Northwestern Colombia.

Anolis meridionalis BOETTGER

Anolis meridionalis BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, pp. 215, 437 (type locality, Paraguay).

RANGE: Paraguay.

Anolis nitens (WAGLER)

Draconura nitens WAGLER, Nat. Syst. Amph., 1830, p. 149 (type locality, America).

Anolis nitens BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 91.

Anolis nitens bondi FOWLER, Proc. Acad. Nat. Sci. Phila., 1913, p. 171 (type locality, Cariquito, Venezuela).

RANGE: Northeastern South America.

Anolis notopholis BOULENGER

Anolis notopholis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 17, 1896, p. 17 (type locality, Buenaventura, Colombia).

RANGE: Colombia.

Anolis ortonii COPE

Anolis ortonii COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 97 (type locality, Napo or Upper Maranon, northeastern Peru).

RANGE: Bolivia, Peru, and Ecuador.

Anolis palmeri BOULENGER

Anolis palmeri BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 1, 1908, p. 112 (type locality, Los Mangos, southwestern Colombia).

RANGE: Southwestern Colombia.

Anolis pentaprion COPE

Anolis pentaprion COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 178 (type locality, Truando River region, northwestern Colombia).

RANGE: Western Ecuador, northward into Central America.

Anolis peraccae BOULENGER

Anolis peraccae BOULENGER, Proc. Zool. Soc. London, 1898, p. 108 (type locality, Chimbo, Ecuador).

RANGE: Ecuador.

Anolis poecilopus COPE

Anolis poecilopus COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 179 (type locality, Colombia).

RANGE: Colombia.

Anolis princeps BOULENGER

Anolis princeps BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 9, 1902, p. 54 (type locality, St. Javier, Salidero, Rio Rita, and Paramba, Ecuador).

RANGE: Ecuador.

Anolis punctatus DAUDIN

Anolis punctatus DAUDIN, Hist. Nat. des Reptiles, Vol. 4, 1802, p. 84 (type locality, the Antilles).

RANGE: Northern South America.

Anolis radulinus COPE

Anolis radulinus COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 180 (type locality, Truando region, Colombia).

RANGE: Northwestern Colombia.

Anolis rosenbergii BOULENGER

Anolis rosenbergii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 17, 1896, p. 16 (type locality, Buenaventura, Colombia).

RANGE: Colombia.

Anolis sagrei COCTEAU

Anolis sagrei COCTEAU, in Duméril and Bibron, Erp. Gén., Vol. 4, 1837, p. 149 (type locality, Cuba).

RANGE: Northern South America.

Anolis scapularis BOULENGER

Anolis scapularis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 1, 1908, p. 113 (type locality, Province of Sara, eastern Bolivia).

RANGE: Bolivia and Peru.

Anolis schiedii (WIEGMANN)

Dactyloa schiedii WIEGMANN, Herpetologia Mexicana, 1834, p. 48 (type locality, not given).

Anolis schiedii BOCOURT, Miss. sci. Mex. et Amer. cent., 1874, p. 64.

RANGE: Northern South America.

Anolis scypheus COPE

Anolis scypheus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 172 (type locality, not given).

RANGE: Ecuador and northern Peru.

Anolis solifer RUTHVEN

Anolis solifer RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 32, 1916, p. 4 (type locality, La Concepcion, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Anolis solitaris RUTHVEN

Anolis solitaris RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 32, 1916, p. 2 (type locality, San Lorenzo, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Anolis squamulatus PETERS

Anolis squamulatus PETERS, Monatsb. Akad. Wiss. Berlin, 1863, p. 145 (type locality, Puerto Cabello, Venezuela, and Panama).

RANGE: Northwestern South America.

Anolis steinbachi GRIFFIN

Anolis steinbachi GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 308, Pl. 33 (type locality, Province of Sara, Bolivia).

RANGE: Bolivia.

Anolis stigmosus BOCOURT

Anolis stigmosus BOCOURT, Nouv. Arch. Mus. Paris, Vol. 5, Bulletin series, 1869, p. 43 (type locality, Magdalena River, Colombia).

RANGE: Colombia and Ecuador.

Anolis sulcifrons COPE

Anolis sulcifrons COPE, Sci. Bull. Phila, Museums, Vol. 1, 1899, p. 6 (type locality, Colombia).

RANGE: Colombia.

Anolis tigrinus PETERS

Anolis tigrinus PETERS, Monatsb. Akad. Wiss. Berlin, 1863, p. 143 (type locality, Veragua, Panama).

RANGE: Unknown.

Anolis tolimensis WERNER

Anolis tolimensis WERNER, Zool. Anz., Vol. 47, 1916, p. 303 (type locality, Canyon of Tolima, Colombia).

RANGE: Colombia.

Anolis trachyderma COPE

Anolis trachyderma COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 168 (type locality, Nauta, northern Peru).

RANGE: Northern Peru.

Anolis transversalis DUMÉRIL

Anolis transversalis DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 57 (type locality, Sarayacu, Peru).

RANGE: Peru.

Anolis tropidogaster HALLOWELL

Anolis tropidogaster HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 224 (type locality, Colombia).

RANGE: Colombia.

Anolis ventrimaculatus BOULENGER

Anolis ventrimaculatus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 20 (type locality, the Rio San Juan, Choco, southwestern Colombia).

RANGE: Colombia.

Anolis vittigerus COPE

Anolis vittigerus COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 179 (type locality, Truando River region, Colombia).

RANGE: Northwestern Colombia.

Genus **Aptycholaemus**

BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 8, 1895, p. 419 (type species, *longicauda*)

Aptycholaemus longicauda BOULENGER

Aptycholaemus longicauda BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 8, 1895, p. 419 (type locality, Riacho del Oro, Argentina).

RANGE: Northeastern Argentina.

Genus **Basiliscus**

LAURENTI, Synops. Reptil., 1768, p. 50 (type species, *americanus*=*basiliscus*)

Basiliscus barbouri RUTHVEN

Basiliscus barbouri RUTHVEN, Proc. Biol. Soc. Wash., Vol. 27, 1914, p. 9 (type locality, Gaira River, at Minca, San Lorenzo, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Basiliscus basiliscus (LINNEAUS)

Lacerta basiliscus LINNAEUS, Syst. Nat., Vol. 10, 1758, p. 366 (type locality, South America).

Basiliscus americanus LAURENTI, Synops. Reptil., 1768, p. 50 (type locality, South America).

Basiliscus basiliscus PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 550.

RANGE: Northwestern Colombia.

Basiliscus galeritus DUMÉRIL

Basiliscus galeritus DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 61 (type locality, Colombia).

RANGE: Colombia and Ecuador.

Genus **Conolophus**

FITZINGER, Syst. Reptil., 1843, p. 55 (type species, *subcristatus*)

Conolophus pallidus HELLER

Conolophus pallidus HELLER, Proc. Washington Acad. Sci., Vol. 5, 1903, p. 87 (type locality, Barrington Island, Galapagos Archipelago).

RANGE: Barrington Island, Galapagos Archipelago.

Conolophus subcristatus (GRAY)

Amblyrhynchus subcristatus GRAY, Zool. Misc., 1831, p. 6 (type locality, Galapagos Islands).

Conolophus subcristatus VAN DENBURGH and SLEVIN, Proc. Calif. Acad. Sci., Ser. 4, Vol. 2, 1913, p. 188.

RANGE: Galapagos Archipelago.

Genus **Corythophanes**

BOIE, Bull. Sci. Nat. et Geol. (Ferussac), Vol. 9, 1826, p. 235
(type species, *cristatus*)

Corythophanes cristatus (MERREM)

Agama cristata MERREM, Ver. Syst. Amph., 1820, p. 51 (type locality, Ceylona, in error).

Corythophanes cristatus GRAVENHORST, Nova Acta Acad. Caes. Leop.-Carol., Vol. 16, 1833, p. 938.

RANGE: Colombia.

Genus **Ctenoblepharys**

TSCHUDI, Fauna Peruana, Herpet., 1845, p. 36 (type species, *adspersus*)

Ctenoblepharys adspersus TSCHUDI

Ctenoblepharys adspersus TSCHUDI, Fauna Peruana, Herpet., 1845, p. 36 (type locality, Hacienda "Acaray", Laguna of Huacho, coast of Peru).

RANGE: Peru.

Ctenoblepharys jamesii BOULENGER

Ctenoblepharis jamesii BOULENGER, Proc. Zool. Soc. London, 1891, p. 3 (type locality, Tarapaca, Chile).

RANGE: Chile.

Ctenoblepharys stolzmanni STEINDACHNER

Ctenoblepharis stolzmanni STEINDACHNER, Anz. Akad. Wiss. Wien, 1891, p. 143 (type locality, Andes of Peru).

RANGE: Peru.

Genus **Enyalioides**

BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 112
(type species, *heterolepis*)

Enyalioides heterolepis (BOCOURT)

Enyalius heterolepis BOCOURT, Ann. Sci. Nat., Ser. 5, Vol. 19, Art. 4, 1874, p. 1 (type locality, Veragua, Panama).

Enyalioides heterolepis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 114.

Enyalioides insulae BARBOUR, Bull. Mus. Comp. Zool., Vol. 46, 1905, p. 100 (type locality, Gorgona Island, Colombia).

Enyalioides mocquardi DESPAX, Reptiles et Batr. de l'Equateur,

in Miss. Arc de Méridian équatorial en Amerique du Sud (1899-1906), Paris, Vol. 9, Zool., fasc. 2, 1911, p. 22 (type locality, Ecuador).

RANGE: Ecuador, northward into Central America.

Enyalioides laticeps festae PERACCA

Enyalioides festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 300, 1897, p. 3 (type locality, Valle del Rio Santiago, Ecuador).

RANGE: Colombia and Ecuador.

Enyalioides laticeps laticeps (GUICHENOT)

Enyalius laticeps GUICHENOT, in Castelnau, Exp. l'Amer. de Sud, Zool., Reptiles, 1855, p. 20 (type locality, Fontaboa, Upper Amazon, Brazil).

Enyalioides laticeps laticeps BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 9.

RANGE: Upper Amazon and eastern Ecuador.

Enyalioides leechii BOULENGER

Enyalioides leechii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 473 (type locality, Santarem, Upper Amazon).

RANGE: Upper Amazon.

Enyalioides microlepis (O'SHAUGHNESSY)

Enyalius microlepis O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 238 (type locality, Sarayacu, Ecuador).

Enyalioides microlepis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 115.

RANGE: Ecuador.

Enyalioides oshaughnessyi (BOULENGER)

Enyalius oshaughnessyi BOULENGER, Proc. Zool. Soc. London, 1881, p. 246 (type locality, Ecuador).

Enyalioides oshaughnessyi BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 115.

RANGE: Ecuador.

Enyalioides palpebralis (BOULENGER)

Enyalius palpebralis BOULENGER, Proc. Zool. Soc. London, 1883, p. 46 (type locality, Cashibaya, eastern Peru).

Enyalioides palpebralis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 114.

RANGE: Eastern Peru.

Enyalioides praestabilis (O'SHAUGHNESSY)

Enyalius praestabilis O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 240 (type locality, Pallatanga and Canelos, Ecuador).

Enyalioides praestabilis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 113.

RANGE: Ecuador.

Genus **Enyalius**

WAGLER, Syst. Amph., 1830, p. 150 (type species, *catenatus*)

Enyalius bibronii BOULENGER

Enyalius bibronii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 119 (type locality, Bahia, Brazil).

RANGE: Brazil.

Enyalius caerulescens COPE

Enyalius caerulescens COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 169 (type locality, Amazons of northern Peru).

RANGE: Northern Peru.

Enyalius catenatus catenatus (WIED)

Agama catenata WIED, Reise nach Brasilien (1815-1817), Vol. 2, 1821, p. 247 (type locality, State of Bahia, Brazil).

Enyalius catenatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 118.

RANGE: Northeastern Brazil.

Enyalius catenatus paulista IHERING

Enyalius catenatus paulista IHERING, Proc. Acad. Nat. Sci. Phila., 1898, p. 102 (type locality, Sao Paulo, Brazil).

RANGE: Southern Brazil.

Enyalius fitzingeri (WIEGMANN)

Laemanctus fitzingeri WIEGMANN, Herpetologia Mexicana, 1834, p. 46 (type locality, Brazil).

Enyalius fitzingeri BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 121.

RANGE: Brazil.

Enyalius iheringii BOULENGER

Enyalius iheringii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 15, 1885, p. 192 (type locality, Rio Grande do Sul, Brazil).

RANGE: Southern Brazil.

Enyalius zonatus WETTSTEIN

Enyalius zonatus WETTSTEIN, Anz. Akad. Wiss. Wien, Vol. 63, 1926, p. 1 (type locality, Ecuador).

RANGE: Ecuador.

Genus **Hoplocercus**

FITZINGER, Syst. Reptil., 1843, p. 78 (type species, *spinosus*)

Hoplocercus annularis O'SHAUGHNESSY

Hoplocercus annularis O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 244 (type locality, Canelos, Ecuador).

RANGE: Ecuador.

Hoplocercus spinosus FITZINGER

Hoplocercus spinosus FITZINGER, Syst. Reptil., 1843, p. 78 (type locality, Brazil).

RANGE: Brazil.

Genus **Iguana**

LAURENTI, Synops. Reptil., 1768, p. 47 (type species, *tuberculata*=*iguana*)

Iguana iguana (LINNAEUS)

Lacerta iguana LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 206 (type locality, America).

RANGE: Central and northern South America, into Central America, often insular.

Genus **Leiocephalus**[1]

GRAY, Philos, Mag. (London), Ser. 2, Vol. 2, 1827, p. 207 (type species, *carinatus*)

Leiocephalus arenarius (TSCHUDI)

Steironotus arenarius TSCHUDI, Fauna Peruana, Herpet., 1845, p. 25 (type locality, Huacho, north of Lima, Peru).

Liocephalus rhodogaster BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 7, 1901, p. 547 (type locality, Merced, Perené River, Peru).

Liocephalus arenarius ROUX, Revue Suisse Zool., Vol. 15, 1907, p. 300.

RANGE: Peru.

Leiocephalus caducus (COPE)

Scartiscus caducus COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 182 (type locality, Paraguay).

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[1] Including *Scartiscus* Cope, Proc. Acad. Nat. Sci. Phila., 1862, p. 182 (type species, *caducus*).

Liocephalus bolivianus BOULENGER, Proc. Zool. Soc. London, 1890, p. 82 (type locality, Bolivia).

Liocephalus caducus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 13, 1894, p. 342.

RANGE: Paraguay and Bolivia.

Leiocephalus dumerilii (STEINDACHNER)

Ophryoessoides dumerilii STEINDACHNER, Novara, Reptil., 1869, p. 33 (type locality, Para, Brazil).

Liocephalus dumerilii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 170.

RANGE: Brazil.

Leiocephalus erythrogaster (HALLOWELL)

Brachysaurus erythrogaster HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 232 (type locality, New Grenada).

Liocephalus erythrogaster BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 168.

RANGE: Colombia.

Leiocephalus formosus[1] BOULENGER

Liocephalus formosus BOULENGER, Bull. Soc. Zool. France, Vol. 5, 1880, p. 43 (type locality, Andes of Ecuador).

RANGE: Ecuador.

Leiocephalus haenchi WERNER

Liocephalus haenchi WERNER, Verhandl. k.k. zool.-bot. Ges. Wien, Vol. 51, 1901, p. 595 (type locality, Balzapamba, Ecuador).

RANGE: Ecuador.

Leiocephalus herminieri (DUMÉRIL AND BIBRON)

Holotropis herminieri DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 261 (type locality, Martinique).

Liocephalus herminieri BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 166.

RANGE: Probably Trinidad[2].

Leiocephalus iridescens aculeatus O'SHAUGHNESSY

Leiocephalus aculeatus O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 4, 1879, p. 303 (type locality, Moyobamba, Peru).

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[1] *Scelotrema formosum* Tschudi, Fauna Peruana, Herpet., 1845, p. 27 (type locality, Tullumayo, central Peru), is probably assignable to the genus *Leiocephalus*, but there is the possibility that it may be a *Stenocercus* species. If it is included in *Leiocephalus*, Boulenger's "*Liocephalus formosus*" is preoccupied.

[2] The range of this form is somewhat in doubt. See Barbour, Mem. Mus. Comp. Zool., Vol. 44, 1914, p. 302.

Liocephalus angulifer WERNER, Verhandl. k.k. zool.-bot. Ges. Wien, Vol. 51, 1901, p. 595 (type locality, unknown).

RANGE: Ecuador and northern Peru.

Leiocephalus iridescens iridescens GÜNTHER

Liocephalus iridescens GÜNTHER, Proc. Zool. Soc. London, 1859, p. 409 (type locality, Andes of western Ecuador).

RANGE: Ecuador and northern Peru.

Leiocephalus lineogularis WERNER

Liocephalus lineogularis WERNER, Abhandl. u. Ber. d. K. Zool. u. Anthr.-Ethn. Mus. Dresden, Vol. 9, No. 2, 1901, p. 3 (type locality, Chanchamayo, Peru).

RANGE: Peru.

Leiocephalus liocephaloides (WERNER)

Scartiscus liocephaloides WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 23 (type locality, Paraguay).

RANGE: Paraguay.

Leiocephalus microlepis GRAY

Leiocephalus microlepis GRAY, Cat. Liz. British Mus., 1845, p. 274 (type locality, Tropical America).

RANGE: Tropical America.

Leiocephalus ornatus ornatus GRAY

Leiocephalus ornatus GRAY, Cat. Liz. British Mus., 1845, p. 219 (type locality, Guayaquil, Ecuador).

Liocephalus guentheri BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 169 (type locality, Ecuador).

Liocephalus festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 300, 1897, p. 6 (type locality, Cuenca, Ecuador).

Leiocephalus ornatus ornatus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 12.

RANGE: Ecuador and northern Peru.

Leiocephalus ornatus trachycephalus (DUMÉRIL)

Holotropis trachycephalus DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 70 (type locality, Santa Fe de Bogota, Colombia).

Liocephalus trachycephalus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 169.

Leiocephalus ornatus trachycephalus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 12.

RANGE: Colombia.

Leiocephalus rhodomelas BOULENGER

Liocephalus rhodomelas BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 4, 1899, p. 455 (type locality, Ona, Andes of Ecuador).

RANGE: Ecuador.

Leiocephalus scapularis BOULENGER

Liocephalus scapularis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 7, 1901, p. 548 (type locality, Perené, Peru).

RANGE: Bolivia and Peru.

Leiocephalus tricristatus (DUMÉRIL)

Ophryoessoides tricristatus DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 66 (type locality, Brazil).

Liocephalus tricristatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 170.

RANGE: Brazil.

Genus **Leiosaurus**[1]

DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 241
(type species, *bellii*)

Leiosaurus belli DUMÉRIL and BIBRON

Leiosaurus bellii DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 242 (type locality, Mexico, in error).

RANGE: Argentina.

Leiosaurus bibronii (BELL)

Diplolaemus bibronii BELL, Zool. "Beagle", 1843, p. 21 (type locality, Port Desire, Argentina).

Leiosaurus bibronii BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6. 1930, p. 13.

RANGE: Argentina.

Leiosaurus catamarcensis KOSLOWSKY

Leiosaurus catamarcensis KOSLOWSKY, Revista Mus. La Plata, Vol. 8, 1898, p. 169 (type locality, Province of Catamarca, Argentina).

RANGE: Argentina.

Leiosaurus darwinii (BELL)

Diplolaemus darwinii BELL, Zool. "Beagle", Reptiles, 1843, p. 20 (type locality, Port Desire, Argentina).

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[1] Including *Pristidactylus* Fitzinger, Syst. Reptil., 1843, p. 16 (type species, *fasciatus*); *Diplolaemus* Bell, Zool. "Beagle", Reptiles, 1843, p. 19 (type species, *darwinii*); *Ptenodactylus* Gray, Cat. Liz. British Mus., 1845, p. 224 (type species, *fasciatus*); and *Aperopristis* Peracca, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 299, 1897, p. 1 (type species, *paronae*).

Leiosaurus darwinii KOSLOWSKY, Revista Mus. La Plata, Vol. 8, 1898, p. 169.

RANGE: Argentina.

Leiosaurus fasciatus DUMÉRIL and BIBRON

Leiosaurus fasciatus DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 244 (type locality, Buenos Aires, Argentina).

RANGE: Argentina.

Leiosaurus paronae (PERACCA)

Aperopristis paronae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 299, 1897, p. 1 (type locality, Brazil).

RANGE: Brazil, southward into Argentina.

Leiosaurus valdivianus PHILIPPI

Leiosaurus valdivianus PHILIPPI, Arch. f. Naturg., 1861, p. 298 (type locality, Valdivia, Chile).

RANGE: Chile.

Genus **Liolaemus**[1]

WIEGMANN, Herpetologia Mexicana, 1834, p. 18 (type species, *chiliensis*)

Liolaemus alticolor BARBOUR

Liolaemus alticolor BARBOUR, Proc. N. Eng. Zool. Club, Vol. 4, 1909, p. 51 (type locality, Tiaguanaco, Bolivia).

RANGE: Bolivia and Peru.

Liolaemus altissimus altissimus MÜLLER and HELLMICH

Liolaemus altissimus altissimus MÜLLER and HELLMICH, Zool. Anz., Vol. 98, 1932, p. 197 (type locality, Fierro Carrera, on the Rio de San Francisco, Massiv des Cerro del Plomo, central Chile).

RANGE: Central Chile.

Liolaemus altissimus araucaniensis MÜLLER and HELLMICH

Liolaemus altissimus araucaniensis MÜLLER and HELLMICH, Zool. Anz., Vol. 98, 1932, p. 205 (type locality, Volcan Villarica, southern Chile).

RANGE: Southern Chile.

Liolaemus anomalous KOSLOWSKY

Liolaemus anomalous KOSLOWSKY, Revista Mus. La Plata, Vol. 7, 1897, p. 452 (type locality, Province of La Roija, Argentina).

RANGE: Argentina.

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[1] Including *Helocephalus* Philippi, Reise Wüste Atacama, 1860, p. 167 (type species, *nigriceps*).

Liolaemus bibronii (BELL)

Proctotretus bibronii BELL, Zool. "Beagle", Reptiles, 1843, p. 6 (type locality, Port Desire, Argentina).

RANGE: Argentina.

Liolaemus bolivianus PELLEGRIN

Liolaemus bolivianus PELLEGRIN, Bull. Mus. Hist. Nat. Paris, 1909, p. 328 (type locality, Andes of Peru and Bolivia).

RANGE: Peru and Bolivia.

Liolaemus boulengeri KOSLOWSKY

Liolaemus boulengeri KOSLOWSKY, Revista Mus. La Plata, Vol. 7, 1896, p. 176 (type locality, Territories of Chubut and Neuquen, Argentina).

RANGE: Argentina.

Liolaemus buergeri WERNER

Liolaemus buergeri WERNER, in Bürger, "Estudios sobre Reptiles Chilenos", An. Univ. Chile, Santiago, 1907, p. 6, Pl. 1, Fig. 1 (type locality, Planchon, Cordillera de Curico, Chile).

RANGE: Chile.

Liolaemus chiliensis (LESSON)

Calotes chiliensis LESSON in Duperry, Voy. "Coquille", zool., Vol. 2, Pt. 1, 1831, p. 36 (type locality, Talcahuano, Province of Concepcion, Chile).

Liolaemus chilensis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 141.

RANGE: Chile.

Liolaemus cyanogaster (DUMÉRIL AND BIBRON)

Proctotretus cyanogaster DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 273 (type locality, Chile).

Liolaemus cyanogaster BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 145.

RANGE: Chile, Bolivia, and southern Peru.

Liolaemus darwinii (BELL)

Proctotretus darwinii BELL, Zool. "Beagle", Reptiles, 1843, p. 14 (type locality, Bahia Blanca, northern Argentina).

Liolaemus darwinii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 155.

RANGE: Argentina.

Liolaemus dorbignyi KOSLOWSKY

Liolaemus dorbignyi KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 174 (type locality, Province of Catamarca, Argentina).

RANGE: Argentina.

Liolaemus elongatus KOSLOWSKY

Liolaemus elongatus KOSLOWSKY, Revista Mus. La Plata, Vol. 7, 1896, p. 450 (type locality, Territory of Chubut, Argentina).

RANGE: Argentina.

Liolaemus erythrogaster WERNER

Liolaemus erythrogaster WERNER, Zool. Jahrb., Suppl., Vol. 4, 1897, pp. 250, 255 (type locality, Coquimbo, Chile).

RANGE: Chile.

Liolaemus fitzgeraldi BOULENGER

Liolaemus fitzgeraldi BOULENGER, in Fitzgerald, Highest Andes, 1899, p. 355 (type locality, Puenta del Inca, Andes of Argentina).

RANGE: Andes of Argentina.

Liolaemus fitzingerii (DUMÉRIL AND BIBRON)

Proctotretus fitzingerii DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 286 (type locality, Chile).

Liolaemus fitzingeri BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 150.

RANGE: Argentina and Chile.

Liolaemus glieschi AHL

Liolaemus glieschi AHL, Zool. Anz., Vol. 62, 1925, p. 88 (type locality, Torres, Brazil).

RANGE: Brazil.

Liolaemus gracilis (BELL)

Proctotretus gracilis BELL, Zool. "Beagle", Reptiles, 1843, p. 4 (type locality, Port Desire, Argentina).

Liolaemus gracilis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 145.

RANGE: Chile and Argentina.

Liolaemus gravenhorstii BOULENGER

Liolaemus gravenhorstii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 142 (type locality, Chile).

RANGE: Chile and Argentina.

Liolaemus hatcheri STEJNEGER

Liolaemus hatcheri STEJNEGER, Report Princeton Univ. Exp. to Patagonia, Vol. 3, Pt. 2, 1909, p. 218 (type locality, Territory of Santa Cruz, southern Argentina).

RANGE: Argentina.

Liolaemus kingii (BELL)

Proctotretus kingii BELL, Zool. "Beagle", 1843, p. 13 (type locality, Port Desire, Argentina).

Liolaemus kingii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 149.

RANGE: Chile and Argentina.

Liolaemus lativittatus WERNER

Liolaemus lativittatus WERNER, Ergeb. Hamburger Magelhaenischen Sammelreise, Pt. 7, 1904, p. 8 (type locality, Lo Choporro, near Valparaiso, Chile).

RANGE: Chile.

Liolaemus lemniscatus GRAVENHORST

Liolaemus lemniscatus GRAVENHORST, Nova Acta Acad. Caes. Leop.-Carol., Vol. 18, Pt. 2, 1838, p. 731 (type locality, Valparaiso, Chile).

RANGE: Chile, Peru, and western Argentina.

Liolaemus lineomaculatus BOULENGER

Liolaemus lineomaculatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 149 (type locality, Patagonia).

RANGE: Argentina.

Liolaemus magellanicus (HOMBRON AND JACQUINOT)

Proctotretus magellanicus HOMBRON and JACQUINOT, Rept. Saur., Pl. 2, Fig. 2, and Figs. B, b, b^1 (without text).—DUMÉRIL and DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 75 (type locality, Havre Pecket, Straits of Magellan).

Liolaemus magallanicus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 148.

Liolaemus (Saccodeira) proximus WERNER, Ergeb. Hamburger Magelhaenischen Sammelreise, Pt. 7, 1904, p. 12 (type locality, Chile).

RANGE: Region of the Straits of Magellan, southern Chile and southern Argentina.

Liolaemus melanops BURMEISTER

Liolaemus melanops BURMEISTER, An. Mus. Nac. Buenos Aires,

Vol. 3, 1888, p. 78 (type locality, Quelle Cura, Chubut, Argentina).

RANGE: Argentina.

Liolaemus micropholis WERNER

Liolaemus micropholis WERNER, Zool. Jahrb. (Syst.), Vol. 28, 1910, p. 268 (type locality, Chile).

RANGE: Chile.

Liolaemus mocquardi PELLEGRIN

Liolaemus mocquardi PELLEGRIN, Bull. Mus. Hist. Nat. Paris, 1909, p. 326 (type locality, Tihuanaco, Department of La Paz, Bolivia).

RANGE: Bolivia.

Liolaemus modestus TSCHUDI

Liolaemus modestus TSCHUDI, Fauna Peruana, Herpet., 1845, p. 34 (type locality, Miraflores, Peru).

RANGE: Peru.

Liolaemus monticola chillanensis MÜLLER and HELLMICH

Liolaemus monticola chillanensis MÜLLER and HELLMICH, Zool. Anz., Vol. 99, 1932, p. 183 (type locality, Termas de Chillan, Chile).

RANGE: Vicinity of Termas de Chillan, Chile.

Liolaemus monticola monticola MÜLLER and HELLMICH

Liolaemus monticola monticola MÜLLER and HELLMICH, Zool. Anz., Vol. 99, 1932, p. 177 (type locality, Tal des Rio de San Francisco, Central Chile).

RANGE: Central Chile.

Liolaemus monticola villaricensis MÜLLER and HELLMICH

Liolaemus monticola villaricensis MÜLLER and HELLMICH, Zool. Anz., Vol. 99, 1932, p. 189 (type locality, Volcan Villarica, southern Chile).

RANGE: Southern Chile.

Liolaemus morio (GUICHENOT)

Chrysosaurus morio GUICHENOT, in Gay, Hist. de Chile, Vol. 2, Zool., 1848, p. 47 (type locality, Valdivia, Chile).

RANGE: Chile.

Liolaemus multiformis multiformis COPE

Proctotretus multiformis COPE, Journ. Acad. Nat. Sci. Phila., Vol. 8, 1876, p. 173 (type locality, Lake of Titicaca, Peru).

Liolaemus multiformis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 153.

Liolaemus lenzi BOETTGER, Zool. Anz., Vol. 14, 1891, p. 344 (type locality, Bolivia, in the vicinity of Lake Titicaca).

Liolaemus annectens BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 7, 1901, p. 546 (type locality, Caylloma and Sumbay, Andes of Peru).

Liolaemus tropidonotus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 10, 1902, p. 397 (type locality, Tirapata, Peru, north of Lake Titicaca).

Liolaemus multiformis multiformis BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 17.

RANGE: Andes of southern Peru and adjacent Bolivia.

Liolaemus multiformis simonsii BOULENGER

Liolaemus simonsii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 10, 1902, p. 398 (type locality, Potosi, Challapata, and Uyuni in Bolivia).

Liolaemus annectens orientalis MÜLLER, Mitt. Zool. Mus. Berlin, Vol. 11, 1924, p. 81 (type locality, near Polcomayo, between Tarija and San Francisco, Bolivia).

RANGE: Andes of southwestern Bolivia.

Liolaemus multimaculatus (DUMÉRIL AND BIBRON)

Proctotretus multimaculatus DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 290 (type locality, Chile).

Liolaemus multimaculatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 157.

RANGE: Chile.

Liolaemus niger (HALLOWELL)

Proctotretus niger HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 233 (type locality, Quinquina Island).

RANGE: Quinquina Island.

Liolaemus nigromaculatus (WIEGMANN)

Tropidurus nigromaculatus WIEGMANN, in Meyen, Reise um die Erde (1830-1832), Vol. 1, 1834, p. 206 (nomen nudum); Nova Acta Acad. Caes. Leop.-Carol., Vol. 17, 1835, Pt. 1, p. 229 (type locality, Chile).

Liolaemus nigromaculatus GRAY, Cat. Liz. British Mus., 1845, p. 213.

RANGE: Chile, Peru, and Argentina.

Liolaemus nitidus (WIEGMANN)

Tropidurus nitidus WIEGMANN, in Meyen, Reise um die Erde 1830-1832), Vol. 1, 1834, p. 206 (nomen nudum); Nova Acta Acad. Caes. Leop.-Carol., Vol. 17, Pt. 1, 1835, p. 234 (type locality, Chile).

Liolaemus nitidus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 140.

RANGE: Chile and Peru.

Liolaemus occipitalis MERTENS

Liolaemus occipitalis MERTENS, Blatt. f. Aquar. u. Terrarienkunde, Vol. 15, 1928, p. 302 (type locality, Brazil).

RANGE: Brazil.

Liolaemus ornatus KOSLOWSKY

Liolaemus ornatus KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 178 (type locality, Mountains in the Province of Jujuy, Argentina).

RANGE: Argentina.

Liolaemus pantherinus PELLEGRIN

Liolaemus pantherinus PELLEGRIN, Bull. Mus. Hist. Nat. Paris, Vol. 15, 1909, p. 324 (type locality, Andes of Peru and Bolivia).

RANGE: Peru and Bolivia.

Liolaemus pictus major BOULENGER

Liolaemus pictus major BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 152 (type locality, Chile).

RANGE: Chile.

Liolaemus pictus pictus (DUMÉRIL AND BIBRON)

Proctotretus pictus DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 276 (type locality, Chile).

Liolaemus pictus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 151.

RANGE: Chile.

Liolaemus platei WERNER

Liolaemus platei WERNER, Zool. Jahrb., Suppl., Vol. 4, 1898, Fauna Chilensis, p. 255 (type locality, Coquimbo, Chile).

RANGE: Chile.

Liolaemus pulcher PELLEGRIN

Liolaemus pulcher PELLEBRIN, Bull. Mus. Hist. Nat. Paris, Vol.

15, 1909, p. 325 (type locality, Tiahuanaco, Department of La Paz, Bolivia).

RANGE: Bolivia.

Liolaemus rothi KOSLOWSKY

Liolaemus rothi KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 177 (type locality, Territory of Neuquen, Argentina).

RANGE: Argentina.

Liolaemus signifer montanus KOSLOWSKY

Liolaemus signifer montanus KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 182 (type locality, Province of Catamarca, Argentina).

RANGE: Province of Catamarca, Argentina.

Liolaemus signifer multicolor KOSLOWSKY

Liolaemus signifer multicolor KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 182 (type locality, Province of Jujuy, Argentina).

RANGE: Province of Jujuy, Argentina.

Liolaemus signifer nigriceps (PHILIPPI)

Helocephalus nigriceps PHILIPPI, Reise Wüste Atacama, 1860, p. 167 (type locality, Pajonal, Atacama desert, Chile).

Liolaemus signifer nigriceps KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 180.

RANGE: Province of Catamarca, Argentina, and adjacent Chile.

Liolaemus signifer signifer (DUMÉRIL AND BIBRON)

Proctotretus signifer DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 288 (type locality, Chile).

Liolaemus signifer BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 154.

RANGE: Chile, southern Peru, and possibly sections of western Argentina.

Liolaemus signifer zonatus KOSLOWSKY

Liolaemus signifer zonatus KOSLOWSKY, Revista Mus. La Plata, Vol. 7, Pt. 1, 1896, p. 181 (type locality, Province of Catamarca, Argentina).

RANGE: Province of Catamarca, Argentina.

Liolaemus tenuis (DUMÉRIL AND BIBRON)

Proctotretus tenuis DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 279 (type locality, Chile).

Liolaemus tenuis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 152.

RANGE: Chile.

Liolaemus variabilis[1] PELLEGRIN

Liolaemus variabilis PELLEGRIN, Bull. Mus. Hist. Nat. Paris, Vol. 15, 1909, p. 327 (type locality, Tihuanaco, Department of La Paz, Bolivia).

Liolaemus variabilis courtyi PELLEGRIN, Bull. Mus. Hist. Nat. Paris, Vol. 15, 1909, p. 328 (type locality, Tihuanaco, Department of La Paz, Bolivia).

Liolaemus variabilis crequii PELLEGRIN, Bull. Mus. Hist. Nat. Paris, Vol. 15, 1909, p. 327 (type locality, Tihuanaco, Department of La Paz, Bolivia).

Liolaemus variabilis neveui PELLEGRIN, Bull. Mus. Hist. Nat. Paris, Vol. 15, 1909, p. 327 (type locality, Tihuanaco, Department of La Paz, Bolivia).

RANGE: Bolivia.

Liolaemus wiegmannii (DUMÉRIL AND BIBRON)

Proctotretus wiegmannii DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 284 (type locality, Chile).

Liolaemus wiegmannii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 156.

RANGE: Argentina, Paraguay, Uruguay, and Chile.

Genus **Norops**

WAGLER, Syst. Amph., 1830, p. 149 (type species, *auratus*)

Norops auratus (DAUDIN)

Anolis auratus DAUDIN, Hist. Nat. des Reptiles, Vol. 4, 1902, p. 89(type locality, not given).

Norops auratus GRAY, Cat. Liz. British Mus., 1845, p. 207.

RANGE: Northern South America.

Norops sladeniae BOULENGER

Norops sladeniae BOULENGER, Proc. Zool. Soc. London, 1903, Vol. 2, p. 69 (type locality, Chapadá, Matto Grosso, Brazil).

RANGE: Brazil.

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[1] Three varieties of this species described by Pellegrin are all from the type locality of *variabilis* itself and all appear to be based upon nothing but trivial variations of the stem form.

Genus **Phenacosaurus**

BARBOUR, Proc. N. Eng. Zool. Club, Vol. 7, 1920, p. 62
(type species, *heterodermus*)

Phenacosaurus heterodermus (DUMÉRIL)

Anolis heterodermus DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 59 (type locality, Colombia).

Phenacosaurus heterodermus BARBOUR, Handbook of Jamaica, Reptiles, 1922, p. 3.

RANGE: Colombia.

Genus **Phrynosaura**

WERNER, in Bürger, "Estudios sobre Reptiles Chilenos", An. Univ. Chile, Santiago, 1907, p. 5 (type species, *reichei*)

Phrynosaura marmorata (BURMEISTER)

Leiosaurus marmoratus BURMEISTER, Reise La Plata, Vol. 2, 1861, p. 552 (type locality, desert west of Catamarca, especially near Alpaquinche and Anapa).

Phrynosaura marmorata MÜLLER, Zool. Anz., Vol. 77, 1928, p. 62.

RANGE: Western Catamarca and adjacent Chile.

Phrynosaura reichei WERNER

Phrynosaura reichei WERNER, in Bürger, "Estudios sobre Reptiles Chilenos", An. Univ. Chile, 1907, p. 5 (type locality, Chile).

RANGE: Chile.

Phrynosaura werneri MÜLLER

Phrynosaura werneri MÜLLER, Zool. Anz., Vol. 77, 1928, p. 64 (type locality, unknown).

RANGE: Probably Argentina or Chile.

Genus **Phymaturus**

GRAVENHORST, Nova Acta Acad. Caes. Leop.-Carol., Vol. 18, 1838, p. 749 (type species, *palluma*)

Phymaturus palluma palluma (MOLINA)

Lucerta palluma MOLINA, Saggio sulla Storia Naturale del Chili, Bologna, Vol. 4, 1782, p. 217 (type locality, Chile).

Phymaturus palluma GRAVENHORST, Nova Acta Acad. Caes. Leop.-Carol., Vol. 18, Pt. 2, 1838, p. 750.

RANGE: Argentina and Chile.

Phymaturus palluma patagonicus KOSLOWSKY

Phymaturus patagonicus KOSLOWSKY, Revista Mus. La Plata, Vol. 8, 1896, p. 184 (type locality, Territory of Chubut, Argentina).

Phymaturus spurcus BARBOUR, Proc. Biol. Soc. Wash., Vol. 34, 1921, p. 139 (type locality, Huanuluan, Rio Negro, Argentina).

RANGE: Argentina.

Genus **Plica**

GRAY, in Griffith's "Cuvier's Animal Kingdom", Vol. 9, 1831, Synops. Reptil., p. 40 (type species, *plica*)

Plica plica (LINNAEUS)

Lacerta plica LINNAEUS, Syst. Nat., ed. 10, 1758, p. 697 (type locality, India, in error).

Plica plica STEJNEGER, Proc. U. S. Nat. Mus., Vol. 24, 1901, p. 182.

RANGE: Northern South America.

Plica stejnegeri BURT and BURT

Plica stejnegeri BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art 6, 1930, p. 24 (type locality, Argentina).

RANGE: Argentina.

Plica tuberculatum ANDERSSON

Plica tuberculatum ANDERSSON, Arkiv. f. Zool., Vol. 11, No. 16, 1918, p. 2 (type locality, San Fermin, northwest Bolivia).

RANGE: Bolivia.

Plica umbra (LINNAEUS)

Lacerta umbra LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 207 (type locality, South America).

Plica umbra O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 245.

RANGE: Northern South America.

Genus **Polychroides**

NOBLE, Occas. Pap. Boston Soc. Nat. Hist., Vol. 5, 1924, p. 109 (type species, *peruvianus*)

Polychroides peruvianus NOBLE

Polychroides peruvianus NOBLE, Occas. Pap. Boston Soc. Nat. Hist., Vol. 5, 1924, p. 109 (type locality, Cajamarca, Peru).

RANGE: Peru.

Genus **Polychrus**

CUVIER, Regne Animal, Vol. 2, 1817, p. 40 (type species, *marmoratus*)

Polychrus gutturosus BERTHOLD

Polychrus gutturosus BERTHOLD, Mitt. Zool. Mus. Göttingen, Vol. 1, 1846, p. 11 (type locality, Province of Popayan, Colombia).

RANGE: Ecuador, northward into Central America.

Polychrus marmoratus acutirostris SPIX

Polychrus acutirostris SPIX, Spec. Novae Lacert. Bras., 1825, p. 15 (type locality, Bahia, Brazil).

RANGE: Southern Brazil, Uruguay, Paraguay, Argentina, and eastern Bolivia.

Polychrus marmoratus femoralis WERNER

Polychrus femoralis WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 21 (type locality, Guayaquil, Ecuador).

RANGE: Southern Ecuador.

Polychrus marmoratus liogaster BOULENGER

Polychrus liogaster BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 1, 1908, p. 113 (type locality, Province of Sara, eastern Bolivia).

RANGE: Bolivia and Peru.

Polychrus marmoratus marmoratus (LINNAEUS)

Lacerta marmorata LINNAEUS, Syst. Nat. Ed. 10, 1758, p. 208 (type locality, America).

Polychrus marmoratus MERREM, Syst, Amph., 1820, p. 48.

RANGE: Northeastern South America.

Polychrus marmoratus spurrelli BOULENGER

Polychrus spurrelli BOULENGER, Proc. Zool. Soc. London, 1914, p. 814 (type locality, Pena Lisa, Condoto, in the Choco of Colombia).

RANGE: Colombia and northwestern Brazil.

Genus **Proctotretus**[1]

DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 266
(type species, *pectinatus*)

Proctotretus arenarius (WERNER)

Saccodeira arenaria WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 26 (type locality, Punta Arenas, Straits of Magellan).

RANGE: Vicinity of Straits of Magellan, Southern South America.

Proctotretus azureus (MÜLLER)

Tropidocephalus azureus MÜLLER, Verhandl. Nat. Ges. Basel, Vol. 7, 1880, pp. 160-161 (type locality, Uruguay).

Proctotretus azureus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 21.

RANGE: Argentina, Uruguay, and southern Brazil.

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[1] Including *Saccodeira* Girard, Proc. Acad. Nat. Sci., Phila., 1857, p. 197 (type species, *ornatissima*).

Proctotretus ornatissimus (GIRARD)

Saccodeira ornatissima GIRARD, Proc. Acad. Nat. Sci. Phila., 1857, p. 198 (type locality, Lower Cordilleras, just below Obrajillo, and Yanga, Peru).

Proctotretus ornatissimus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 22.

RANGE: Ecuador and Peru.

Proctotretus pectinatus DUMÉRIL and BIBRON

Proctotretus pectinatus DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 292 (type locality, Chile).

RANGE: Argentina, Brazil, and Chile.

Genus **Stenocercus**

DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 350
(type species, *roseiventris*)

Stenocercus atrigularis WERNER

Stenocercus atrigularis WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 30, Pt. 2, 1912, p. 11 (type locality, Province of Beni, Bolivia).

RANGE: Bolivia.

Stenocercus boettgeri BOULENGER

Stenocercus boettgeri BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 22 (type locality, Huancabamba, Peru).

RANGE: Ecuador and Peru.

Stenocercus chrysopygus BOULENGER

Stenocercus chrysopygus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 6, 1900, p. 182 (type locality, Huaras and Recuay, Peru).

RANGE: Peru.

Stenocercus crassicaudatus (TSCHUDI)

Scelotrema crassicaudata TSCHUDI, Fauna Peruana, Herpet., 1845, p. 28 (type locality, Urubamba, Peru).

Stenocercus torquatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 133 (type locality, Peru).

Stenocercus crassicuadatus ROUX, Rev. Suisse Zool., Vol. 15, 1907, p. 299.

Stenocercus ervingi STEJNEGER, Proc. U. S. Nat. Mus., Vol. 45, 1913, p. 545 (type locality, Huadquinia, Peru).

RANGE: Peru.

Stenocercus cupreus BOULENGER

Stenocercus cupreus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 135 (type locality, Huanuco, Peru).

RANGE: Peru.

Stenocercus difficilis WERNER

Stenocercus difficilis WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 23 (type locality, Cochabamba, Bolivia).

RANGE: Bolivia.

Stenocercus humeralis (GÜNTHER)

Microphractus humeralis GÜNTHER, Proc. Zool. Soc. London, 1859, p. 90 (type locality, Andes of western Ecuador).

Stenocercus humeralis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 134.

RANGE: Ecuador.

Stenocercus marmoratus (DUMÉRIL AND BIBRON)

Trachycyclus marmoratus DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 356 (type locality, South America).

Stenocercus marmoratus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 132.

RANGE: Bolivia.

Stenocercus melanopygus BOULENGER

Stenocercus melanopygus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 6, 1900, p. 182 (type locality, Banos, Cajamarca, Peru).

RANGE: Peru.

Stenocercus moestus BOULENGER

Stenocercus moestus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 136 (type locality, Lima, Peru).

RANGE: Peru.

Stenocercus nigromaculatus NOBLE

Stenocercus nigromaculatus NOBLE, Occas. Pap. Boston Soc. Nat. Hist., Vol. 5, 1924, p. 112 (type locality, Huancabamba, Province of Piura, Peru).

RANGE: Ecuador and northern Peru.

Stenocercus roseiventris D'ORBIGNY

Stenocercus roseiventris D'ORBIGNY, in Duméril and Bibron, Erp. Gén., Vol. 4, 1837, p. 350 (type locality, Bolivia).

RANGE: Bolivia.

Stenocercus seydi ANDERSSON

Stenocercus seydi ANDERSSON, Jahrb. Nassau Ver. f. Naturk. Wiesbaden, Vol. 61, 1908, p. 301 (type locality, La Merced, Peru).

RANGE: Peru.

Stenocercus simonsii BOULENGER

Stenocercus simonsii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 4, 1899, p. 454 (type locality, Ona, Ecuador).

RANGE: Ecuador.

Stenocercus variabilis BOULENGER

Stenocercus variabilis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 7, 1901, p. 546 (type locality, Palca, Bolivia).

RANGE: Bolivia.

Stenocercus varius BOULENGER

Stenocercus varius BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 134 (type locality, unknown).

RANGE: Ecuador.

Genus **Strobilurus**

WIEGMANN, Herpetologia Mexicana, 1834, p. 18 (type species, *torquatus*)

Strobilurus torquatus WIEGMANN

Strobilurus torquatus WIEGMANN, Herpetologia Mexicana, 1834, p. 18 (type locality, not given).

RANGE: Brazil.

Genus **Tropidodactylus**

BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 97 (type species, *onca*)

Tropidodactylus onca (O'SHAUGHNESSY)

Norops onca O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 4, Vol. 15, 1875, p. 280 (type locality, Venezuela and Dominica).

Tropidodactylus onca BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 97.

RANGE: Northern South America.

Genus **Tropidurus**

WIED, Abbild. Naturgesch. Bras., 1824, p. unnumbered (type species, *torquatus*)

Tropidurus albemarlensis albemarlensis BAUR

Tropidurus albemarlensis BAUR, Biol. Centralbl., Vol. 10, 1890, p. 478 (nomen nudum); Feschr. f. Leukart, 1892, pp. 265, 269

(type locality, Tagus Cove, Albemarle Island, Galapagos Archipelago).

Tropidurus albemarlensis albemarlensis BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 23.

RANGE: Albemarle, Daphne, Indefatigable, James, South Seymour, Cowley, Brattle, and Narborough islands, Galapagos Archipelago.

Tropidurus albemarlensis barringtonensis BAUR

Tropidurus barringtonensis BAUR, Feschr. f. Leukart, 1892, p. 268 (type locality, Barrington Island, Galapagos Archipelago).

Tropidurus albemarlensis barringtonensis VAN DENBURGH and SLEVIN, Proc. Calif. Acad. Sci., Ser. 4, Vol. 2, 1913, p. 168.

RANGE: Barrington Island, Galapagos Archipelago.

Tropidurus bivittatus (PETERS)

Craniopeltis bivittata PETERS, Monatsb. Akad. Wiss. Berlin, 1871, p. 645 (type locality, Chatham Island, Galapagos Archipelago).

Tropidurus bivittatus VAN DENBURGH and SLEVIN, Proc. Calif. Acad. Sci., Ser. 4, Vol. 2, 1913, p. 155.

RANGE: Chatham Island, Galapagos Archipelago.

Tropidurus blainvilli (DUMÉRIL AND BIBRON)

Tropidogaster blainvilli DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 330 (type locality, unknown).

Tropidurus blainvilli BOULENGER, Vol. 2, 1885, p. 178.

RANGE: South America.

Tropidurus delanonis BAUR

Tropidurus delanonis BAUR, Biol. Centralbl., Vol. 10, 1890, pp. 478-479 (type locality, Hood Island, Galapagos Archipelago).

RANGE: Hood and Gardner Islands, Galapagos Archipelago.

Tropidurus duncanensis BAUR

Tropidurus duncanensis BAUR, Biol. Centralbl., Vol. 10, 1890, p. 479 (type locality, Duncan Island, Galapagos Archipelago).

RANGE: Duncan Island, Galapagos Archipelago.

Tropidurus grayii (BELL)

Leiocephalus grayii BELL, Zool. "Beagle", Reptiles, 1843, p. 24 (type locality, Charles and Chatham islands, Galapagos Archipelago).

Tropidurus grayii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 172.

RANGE: Charles Island and its neighboring islets, Gardner, Champion, and Enderby islands, Galapagos Archipelago; not on Chatham Island, Galapagos Archipelago.

Tropidurus habelli STEINDACHNER

Tropidurus pacificus habelli STEINDACHNER, Festschr. zool.-bot. Ges. Wien, 1876, p. 314 (type locality, Bindloe Island, Galapagos Archipelago).

Tropidurus habelli VAN DENBURGH and SLEVIN, Proc. Calif. Acad. Sci., Ser. 4, Vol. 2, 1913, p. 150.

RANGE: Bindloe Island, Galapagos Archipelago.

Tropidurus holotropis BOULENGER

Tropidurus holotropis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 10, 1912, p. 420 (type locality, Alpayacu, Rio Pastaza, eastern Ecuador).

RANGE: Ecuador and northwestern Peru.

Tropidurus melanopleurus BOULENGER

Tropidurus melanopleurus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 10, 1902, p. 399 (type locality, Tamampoya, Bolivia).

RANGE: Bolivia.

Tropidurus occipitalis bocourtii (BOULENGER)

Aneuporus occipitalis BOCOURT, Miss. Sci. Mex. et. Amer. Cent., 1874, p. 215 (type locality, Peru).—*Tropidurus bocourtii* BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 173 [new name for *Tropidurus occipitalis* (Bocourt, 1874), preoccupied by *Tropidurus occipitalis* (Peters, 1871)].

Tropidurus occipitalis bocourtii BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 25.

RANGE: Interior of Ecuador and northern Peru.

Tropidurus occipitalis occipitalis PETERS

Tropidurus (Laemopristis) occipitalis PETERS, Monatsb. Akad. Wiss. Berlin, 1871, p. 645 (type locality, Peru).

Tropidurus stolzmanni STEINDACHNER, Ann. k.k. Naturhist. Hofmus. Wien, Vol. 6, 1891, p. 376 (type locality, Chota, Peru).

Tropidurus tschudi ROUX, Revue Suisse Zool. Vol. 15, 1907, p. 297 (type locality, Peru).

Tropidurus continentalis MÜLLER, Mitt. Zool. Mus. Berlin, Vol. 11, 1924, p. 83 (type locality, Machalilla, Ecuador).

Tropidurus occiptalis occipitalis BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 25.

RANGE: Western Ecuador and northwestern Peru.

Tropidurus pacificus STEINDACHNER

Tropidurus (Craniopeltis) pacificus STEINDACHNER, Festschr. zool.-bot. Ges. Wien, 1876, p. 313 (type locality, Indefatigable and Bindloe Islands, Galapagos Archipelago).

RANGE: Abingdon Island, Galapagos Archipelago.

Tropidurus peruvianus (LESSON)

Stellio peruvianus LESSON, in Duperry, Voy. "Coquille", Zool., Atlas, Reptiles, 1826, Pl. 2, Fig. 2 (original illustration); text, Vol. 2, Pt. 1, 1831, p. 40 (type locality Callao and Paita, coast of Peru).

Tropidurus peruvianus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 174.

Tropidurus thomasi BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 6, 1900, p. 184 (type locality, Eten, coast of Peru).

Tropidurus theresiae STEINDACHNER, Anz. Akad. Wiss. Wien, Vol. 38, 1901, p. 195 (type locality, Ancon, near Lima, Peru).

RANGE: Southern Ecuador, Peru, and northern Chile.

Tropidurus pictus MÜLLER

Tropidurus pictus MÜLLER, Mitt. Zool. Mus. Berlin, 1924, No. 11, p. 86 (type locality, Pilcomayo, between Tarija and San Francisco, Bolivia).

RANGE: Bolivia.

Tropidurus praeornatus MÜLLER

Tropidurus praeornatus MÜLLER, Mitt. Zool. Mus. Berlin, 1924, No. 11, p. 83 (type locality, Pilcomayo, between Tarija and San Francisco, Bolivia).

RANGE: Bolivia.

Tropidurus semitaeniatus (SPIX)

Agama semitaeniata SPIX, Spec. Novae Lacert, Bras., 1825, p. 13 (type locality, Bahia, Brazil).

Tropidurus semitaeniatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 178.

RANGE: Brazil.

Tropidurus spinulosus (COPE)

Microlophus spinulosus COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 351 (type locality, Paraguay).

Tropidurus spinulosus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 175.

RANGE: Southeastern Brazil, Paraguay, and Argentina.

Tropidurus torquatus hispidus (SPIX)

Agama hispida SPIX, Spec. Novae Lacert, Bras., 1825, p. 12 (type locality, Bahia, Brazil).

Tropidurus hispidus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 177.

Tropidurus torquatus hispidus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 26.

RANGE: Northern South America.

Tropidurus torquatus torquatus (WIED)

Stellio torquatus WIED, Reise nach Bras. (1815-1917), Vol. 1, 1820, p. 106 (type locality, Brazil).

Tropidurus torquatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 176.

Tropidurus torquatus torquatus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 27.

RANGE: Brazil, Bolivia, Uruguay, Paraguay, and Argentina.

Tropidurus unicarinatus WERNER

Tropidurus unicarinatus WERNER, Zool. Anz., Vol. 22, 1899, p. 480 (type locality, Surinam).

RANGE: Northeastern South America.

Genus **Uranoscodon**

KAUP, in Oken, Isis, Vol. 18, 1826, p. 89 (type species, *superciliosa*)

Uranoscodon superciliosa (LINNAEUS)

Lacerta superciliosa LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 200 (type locality, South America and India).

Uranoscodon superciliosa KAUP, in Oken, Isis, 1825, p. 590.

RANGE: Northeastern South America; Venezuela.

Genus **Urocentron**

KAUP, in Oken, Isis, Vol. 19, 1827, p. 612 (type species, *azureum*)

Urocentron azureum (LINNAEUS)

Lacerta azurea LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 202 (type locality, Brazil).

Urocentron azureum KAUP, in Oken, Isis, Vol. 19, 1827, p. 612.

RANGE: Brazil.

Urocentron castor COPE

Urocentron castor COPE, Proc. Amer. Philos. Soc., Vol. 11, 1870, p. 556 (type locality, Pebas, Ecuador).

RANGE: Southern Ecuador and probably northern Peru.

Urocentron guentheri BOULENGER

Urocentrum guentheri BOULENGER, Proc. Zool. Soc. London, 1894, p. 729 (type locality, Iquitos, Peru).

RANGE: Peru.

Urocentron meyeri WERNER

Urocentrum meyeri WERNER, Abhandl. u. Ber. Zool. u. Anthr.-Ethn. Mus. Dresden, Vol. 9, 1901, No. 2, p. 4 (type locality, Lima, Peru).

RANGE: Peru.

Urocentron palluma TSCHUDI

Uroncentron palluma TSCHUDI, Fauna Peruana, Herpet., 1845, p. 35 (type locality, Chile and Peru).

RANGE: Chile and Peru.

Genus **Urostrophus**

DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 77
(type species, *vautieri*)

Urostrophus scapulatus (BURMEISTER)

Leiosaurus scapulatus BURMEISTER, Reise La Plata Staaten, Vol. 2, 1861, p. 522 (type locality, Sierra de Uspallata, Argentina).—BOULENGER, Proc. Zool. Soc. London, 1889, p. 144, Pl. 15.

Leiosaurus multipunctatus BURMEISTER, Reise La Plata Staaten, Vol. 2, 1861, p. 524 (type locality, Sierra de Uspallata, Argentina).

RANGE: Argentina.

Urostrophus torquatus (PHILIPPI)

Leiosaurus torquatus PHILIPPI, Arch. f. Naturg., 1861, p. 295 (type locality, Chile).

Urostrophus torquatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 124.

RANGE: Chile.

Urostrophus vautieri DUMÉRIL and BIBRON

Urostrophus vautieri DUMÉRIL and BIBRON, Erp. Gén., Vol. 4, 1837, p. 78 (type locality, Brazil).

RANGE: Brazil.

ANGUIDAE (*FAMILY*)

Genus **Diploglossus**

WIEGMANN, Herpetologia Mexicana, 1834, p. 36
(type species, *fasciatus*)

Diploglossus hancocki (SLEVIN)

Celestus hancocki SLEVIN, Proc. Calif. Acad. Sci., Ser. 4, Vol. 16, 1928, p. 682 (type locality, Malpelo Island).

RANGE: Malpelo Island.

Diploglossus lessonae PERACCA

Diploglossus lessonae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 5, No. 77, 1890, pp. 1-5 (type locality, Brazil).

RANGE: Brazil.

Diploglossus millepunctatus O'SHAUGHNESSY

Diploglossus millepunctatus O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 4, Vol. 13, 1874, p. 301 (type locality, northwest coast of America).

RANGE: Northwestern South America.

Diploglossus resplendens BARBOUR

Diploglossus resplendens BARBOUR, Proc. N. Eng. Zool. Club, Vol. 4, 1909, p. 50 (type locality, junction of the Kaka and Beni Rivers, tropical eastern Bolivia).

RANGE: Bolivia.

Diploglossus tenuifasciatus PARKER

Diploglossus tenuifasciatus PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 13, 1924, p. 586 (type locality, Natal, Rio Grande do Norte, Brazil).

RANGE: Southern Brazil.

Genus **Ophiodes**

WAGLER, in Oken, Isis, 1828, p. 740 (type species, *striatus*)

Ophiodes grilli BOULENGER

Ophiodes grilli BOULENGER, Ann. Mus. Civ. Stor. Nat. Genova, Ser. 3, Vol. 6, 1913, p. 49 (type locality, Curityba, Parana, Brazil).

RANGE: Brazil.

Ophiodes intermedius BOULENGER

Ophiodes intermedius BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 13, 1894, p. 343 (type locality, Asuncion, Paraguay).

RANGE: Bolivia and Paraguay.

Ophiodes striatus (SPIX)

Pygopus striatus SPIX, Spec. Novae Lacert, Bras., 1825, p. 25 (type locality, Rio de Janeiro, Brazil).

Ophiodes striatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 296.

RANGE: Argentina, Uruguay, Paraguay, and Brazil.

Ophiodes vertebralis BOCOURT

Ophiodes vertebralis BOCOURT, Miss. sci. Mex. et Amer. cent., 1881, p. 459 (type locality, southern Brazil and Uruguay).

RANGE: Argentina, Brazil, and Uruguay).

TEIIDAE (*FAMILY*)

Genus **Ameiva**

MEYER, Synops. Reptil., 1795, p. 27 (type species, *americana*=*ameiva*)

Ameiva ameiva ameiva (LINNAEUS)

Lacerta ameiva LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 202 (type locality, Brazil).

Ameiva ameiva ameiva BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 462.

RANGE: Central and northern South America, except in the northwest portion.

Ameiva ameiva laeta COPE

Ameiva laeta COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 65 (type locality, Rio de Janeiro, Brazil).

Ameiva ameiva laeta BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 467.

RANGE: Southern Brazil.

Ameiva ameiva praesignis (BAIRD AND GIRARD)

Cnemidophorus praesignis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 129 (type locality, Panama).

Cnemidophorus maculatus FISCHER, Verhandl. Naturw. Ver. Hamburg, 1879, p. 95 (type locality, Sabana-larga, Colombia).

Ameiva ameiva praesignis BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 468.

Ameiva ameiva maculata BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 467.

Ameiva ameiva vogli MÜLLER, Zool. Anz., Vol. 83, 1929, p. 100 (type locality, Barinas [Zamora], Venezuela).

RANGE: Northwestern South America and Central America.

Ameiva atrigularis GARMAN

Ameiva surinamensis atrigularis GARMAN, Bull. Essex Inst., Vol. 19, 1887, p. 2 (type locality, Trinidad).

Ameiva atrigularis BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 460.

RANGE: Trinidad.

Ameiva bifrontata bifrontata COPE

Ameiva bifrontata COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 67 (type locality, St. Thomas, West Indies, probably incorrect; and New Grenada, probably correct).

Ameiva bifrontata bifrontata RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 155, 1924, p. 6.

RANGE: Northeastern South America, Dutch Leeward Islands, and Margarita Island.

Ameiva bifrontata concolor RUTHVEN

Ameiva bifrontata concolor RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 155, 1924, p. 3 (type locality, Paipoy, Rio Crisnejas, Peru).

RANGE: Southern and central Peru.

Ameiva bifrontata divisa (FISCHER)

Cnemidophorus divisus FISCHER, Verhandl, Naturw. Ver. Hamburg, 1879, p. 99 (type locality, Baranquilla, Colombia).

Ameiva bifrontata divisa RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 155, 1924, p. 6.

RANGE: Northwestern South America.

Ameiva bifrontata insulana RUTHVEN

Ameiva insulana RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 149, 1924, p. 1 (type locality, Testigos Island, Venezuela).

Ameiva bifrontata insulana RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 155, 1924, p. 6.

RANGE: Testigos Island, Venezuela.

Ameiva edracantha BOCOURT

Ameiva edracantha BOCOURT, Miss. sci. Mex. et Amer. cent., 1874, p. 263 (type locality, Mexico, probably in error).

Cnemidophorus armatulus COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 165 (type locality, Jequetepeque, Peru).

Ameiva septemlineata BARBOUR and NOBLE (not of Duméril), Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 477.

RANGE: Ecuador.

Ameiva festiva (LICHTENSTEIN)

Cnemidophorus festivus LICHTENSTEIN, Nomencl. Mus. Zool. Berol., 1856, p. 13 (type locality, Veragoa, Panama).

Ameiva eutropia COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 62 (Truando River, northwestern Colombia).

Ameiva festiva BOCOURT, Miss. sci. Mex. et Amer. cent., 1874, p. 260.

Ameiva ruthveni BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, 1915, p. 471 (type locality, near city of Panama).

RANGE: Colombia, northward into Central America.

Ameiva lacertoides (DUMÉRIL AND BIBRON)

Cnemidophorus lacertoides DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 134 (type locality, Montevideo, Uruguay).

Cnemidophorus leachei PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 274, 1897, p. 6 (type locality, Jujuy, Argentina).

RANGE: Southern South America.

Ameiva longicauda BELL

Ameiva longicauda BELL, Zool. "Beagle", Reptiles, 1843, p. 28 (type locality, Bahia Blanca, Argentina).

Cnemidophorus multilineatus PHILIPPI, Arch. f. Naturg., Vol. 35, 1869, p. 41 (type locality, Mendoza, Argentina).

RANGE: Southern South America.

Ameiva septemlineata DUMÉRIL

Ameiva septemlineata DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 114 (type locality, South America).

Ameiva sex-scutata GÜNTHER, Proc. Zool. Soc. London, 1859, p. 402 (type locality, Andes of western Ecuador).

Holcosus bridgesii COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 306 (type locality, not given).

Ameiva bridgesii BARBOUR and NOBLE, Bull. Mus. Comp. Zool., Vol. 59, p. 478.

RANGE: Bolivia and possibly northern Chile, northward into Colombia.

Ameiva vittata (BOULENGER)

Cnemidophorus vittatus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 10, 1902, p. 400 (type locality, Paratani, Bolivia).

RANGE: Bolivia.

Genus **Anadia**

GRAY, Cat. Liz. British Mus., 1845, p. 74
(type species, *ocellata*)

Anadia angusticeps PARKER

Anadia angusticeps PARKER, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 17, 1926, p. 550 (type locality, Gorgona Island, west Colombia).

RANGE: Gorgona Island.

Anadia bitaeniata BOULENGER

Anadia bitaeniata BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 12, 1903, p. 430 (type locality, Escorial and Culata, Venezuela).

RANGE: Venezuela.

Anadia bogotensis (PETERS)

Ecpleopus (Xestosaurus) bogotensis PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 217 (type locality, Santa Fe de Bogota, Colombia).

Anadia bogotensis BOULENGER, Vol. 2, 1885, p. 400.

RANGE: Colombia.

Anadia nicefori LOVERIDGE

Anadia nicefori LOVERIDGE, Proc. Biol. Soc. Wash., Vol. 42, 1929, p. 99 (type locality, Rio Garagoa at Macanal, eastern Andes, Colombia).

RANGE: Andes of eastern Colombia.

Anadia ocellata GRAY

Anadia ocellata GRAY, Cat. Liz. British Mus., 1845, p. 58 (type locality, unknown).

RANGE: Northwestern South America.

Anadia pulchella RUTHVEN

Anadia pulchella RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 177, 1926, p. 1 (type locality, La Cumbre, Hacienda Vista Nieve, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Anadia rhombifera (GÜNTHER)

Cercosaura rhombifera GÜNTHER, Proc. Zool. Soc. London, 1859, p. 405 (type locality, western Ecuador).

Anadia rhombifera BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 399.

RANGE: Ecuador.

Anadia steyeri NIEDEN

Anadia steyeri NIEDEN, Sitz. Ges. Naturf. Freunde, 1914, p. 365 (type locality, Puerto Cabello, Venezuela).

RANGE: Venezuela.

Anadia vittata BOULENGER

Anadia vittata BOULENGER, Proc. Zool. Soc. London, 1913, p. 1033 (type locality, Pena Lisa, Condoto, in the Choco, Colombia).

RANGE: Colombia.

Genus **Argalia**

GRAY, Ann. and Mag. Nat. Hist., Ser. 1, Vol. 18, 1846, p. 67
(type species, *marmorata*)

Argalia marmorata GRAY

Argalia marmorata GRAY, Ann. and Mag. Nat. Hist., Ser. 1, Vol. 18, 1846, p. 67 (type locality, Colombia).

RANGE: Northwestern South America.

Genus **Arthrosaura**

BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 389
(type species, *reticulata*)

Arthrosaura concolor (TSCHUDI)

Pantodactylus concolor TSCHUDI, Arkiv f. Naturg., Vol. 30, 1847, pp. 48, 50 (type locality, northern Brazil).

RANGE: Northern Brazil.

Arthrosaura kockii (VAN LIDTH DE JEUDE)

Prionodactylus kockii VAN LIDTH DE JEUDE, Notes from the Leyden Mus., Vol. 25, 1904, p. 91 (type locality, Coppename section of Dutch Guiana).

Arthrosaura kocki BRONGERSMA, Zool. Anz., Vol. 78, 1928, p. 333.

RANGE: Northeastern South America.

Arthrosaura reticulata (O'SHAUGHNESSY)

Cercosaura (Pantodactylus) reticulata O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 230 (type locality, Canelos, Ecuador).

Arthrosaura reticulata BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 389.

RANGE: Ecuador.

Arthrosaura tatei BURT and BURT

Arthrosaura tatei BURT and BURT, Bull. Amer. Mus. Nat. Hist., Vol. 61, 1931, p. 313 (type locality, Vegas Falls, 15 miles north of Esmeralda, Venezuela, in the Mount Duida region).

RANGE: Venezuela.

Arthrosaura versteegii VAN LIDTH DE JEUDE

Arthrosaura versteegii VAN LIDTH DE JEUDE, Notes from the Leyden Mus., Vol. 25, 1904, p. 89 (type locality, Cottica Mountains, Dutch Guiana).

RANGE: Northeastern South America.

Genus **Arthroseps**

BOULENGER, Proc. Zool. Soc. London, 1898, p. 920
(type species, *werneri*)

Arthroseps werneri BOULENGER

Arthroseps werneri BOULENGER, Proc. Zool. Soc. London, 1898, p. 921 (type locality, Blumenau, Santa Catharina, Brazil).

RANGE: Southern Brazil.

Genus **Bachia**

GRAY, Cat. Liz. British Mus., 1845, p. 57
(type species, *dorbignyi*)

Bachia barbouri BURT and BURT

Bachia barbouri BURT and BURT, Bull. Amer. Mus. Nat. Hist., Vol. 61, 1931, p. 318 (type locality, Perico, Peru).

RANGE: Northwestern Peru.

Bachia boettgeri (BOULENGER)

Cophias boettgeri BOULENGER, Cat. Liz. British Mus., Vol. 3, 1887, pp. 507-508 (type locality, unknown).

RANGE: Uncertain, possibly South American.

Bachia cophias (SCHNEIDER)

Chamaesaura cophias SCHNEIDER, Hist. Amph., Pt. 2, 1801, p. 209 (type locality, unknown).

Bachia cophias RUTHVEN, Proc. Boston Soc. Nat. Hist., Vol. 38, 1925, p. 108.

RANGE: Northeastern South America to eastern Colombia.

Bachia dorbignyi (DUMÉRIL AND BIBRON)

Chalcides dorbignyi DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 462 (type locality, Santa Cruz, Chile).

Bachia dorbignyi RUTHVEN, Proc. Boston Soc. Nat. Hist., Vol. 38, 1925, p. 109.

RANGE: Bolivia and Chile.

Bachia heteropa (LICHTENSTEIN)

Chalcides heteropus LICHTENSTEIN, Nomenel, Mus. Zool. Berol., 1856, p. 17 (type locality, La Guaira, Venezuela).

RANGE: Venezuela.

Bachia intermedia NOBLE

Bachia intermedia NOBLE, Ann. N. Y. Acad. Sci., Vol. 29, 1921, p. 142 (type locality, Perico, Department of Cajamarca, Peru).

RANGE: Northwestern Peru.

Bachia lineata BOULENGER

Bachia lineata BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 12, 1903, p. 432 (type locality, Duaca, Venezuela).

Bachia anomala ROUX, Verhandl. Naturf. Ges. Basel, Vol. 40, Pt. 2, 1929, p. 31 (El Mene, District of Acosta, Province of Falcon, Venezuela).

RANGE: Venezuela.

Bachia parkeri RUTHVEN

Bachia parkeri RUTHVEN, Proc. Boston Soc. Nat. Hist., Vol. 38, 1925, p. 103 (type locality, Chenapown River, on the Upper Potaro River, British Guiana).

RANGE: Northeastern South America to eastern Colombia.

Bachia peruana (WERNER)

Cophias peruanus WERNER, Abhandl. u. Ber. Zool. u. Anthr.-Ethn. Mus. Dresden, Vol. 9, No. 2, 1900, p. 5 (type locality, Chanchamayo, Peru).

Bachia peruana RUTHVEN, Proc. Boston Soc. Nat. Hist., Vol. 38, 1925, p. 108.

RANGE: Peru.

Bachia talpa RUTHVEN

Bachia talpa RUTHVEN, Proc. Boston Soc. Nat. Hist., Vol. 38, 1925, p. 101 (type locality, Valle Dupar, Santa Marta Mountains, Colombia).

RANGE: Colombia.

Bachia tridactyla[1] (DAUDIN)

Chalcides tridactylus DAUDIN, Hist. Nat. des Reptiles, Vol. 4, 1802, p. 367 (type locality, unknown).

Bachia tridactyla RUTHVEN, Proc. Boston Soc. Nat. Hist., Vol. 38, 1925, p. 108.

RANGE: Unknown, but probably South American.

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[1] The *Chalcides flavescens* of Bonnaterre (1789), apparently the oldest described species of *Bachia*, is not recognized by herpetologists at present. From the original description and figure it appears to us that it is probably this species *(tridactyla)* which was described at a much later date.

Genus **Calliscincopus**

RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 22, 1916, p. 2
(type species, *agilis*)

Calliscincopus agilis RUTHVEN

Calliscincopus agilis RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 22, 1916, p. 2 (type locality, sand ridges on the Demerara River, near Dunoon, British Guiana).

Tretioscincus romani ANDERSON, Arkiv f. Zool., Vol. 11, No. 16, 1918, p. 5 (type locality, Amazonas, Manaos, Bosque Municipal, Brazil).

Tretioscincus brasiliensis MULLER, Zool. Anz., Vol. 57, 1923, p. 49 (type locality, Unterer Tocantins, Staat Para, Brazil).

RANGE: Northeastern South America.

Genus **Callopistes**

GRAVENHORST, Nova Acta Acad. Caes. Leop.-Carol., Vol. 18, 1838, p. 743 (type species, *maculatus*)

Callopistes flavipunctatus (DUMÉRIL AND BIBRON)

Aporomera flavipunctata DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 72 (type locality, the New World).

Callopistes flavipunctatus GRAY, Cat. Liz. British Mus., 1845, p. 17.

RANGE: Peru.

Callopistes maculatus GRAVENHORST

Callopistes maculatus GRAVENHORST, Nova Acta Acad. Caes. Leop.-Carol., Vol. 18, 1838, Pt. 2, p. 744 (type locality, Chile).

RANGE: Chile.

Genus **Cercosaura**

WAGLER, Syst. Amph., 1830, p. 154 (type species, *ocellata*)

Cercosaura ocellata WAGLER

Cercosaura ocellata WAGLER, Syst. Amph., 1830, p. 158 (type locality, Asia, in error).

RANGE: Central and northern South America.

Genus **Cnemidophorus**

WAGLER, Syst. Amph., 1830, p. 154 (type species, *murinus*)

Cnemidophorus lemniscatus lemniscatus (LINNAEUS)

Lacerta lemniscata LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 209 (type locality, Guinea, lapsus clami for Guiana).

Cnemidophorus lemniscatus lemniscatus BEEBE, Zoologica, Vol. 2, 1919, p. 212.

RANGE: Northern South America, northward into Central America; often insular.

Cnemidophorus lemniscatus nigricolor PETERS

Cnemidophorus nigricolor PETERS, Sitz.-Ber. Ges. Naturf. Freunde Berlin, 1873, p. 76 (type locality, Los Rocques Islands, north of Venezuela).

RANGE: Islands north of Venezuela from the Aves Group east to Blanquilla, and southward on Margarita Island.

Cnemidophorus murinus arubensis VAN LIDTH DE JEUDE

Cnemidophorus arubensis VAN LIDTH DE JEUDE, Notes from the Leyden Mus., Vol. 9, 1887, p. 132 (type locality, Aruba, Dutch Leeward Islands).

RANGE: Aruba, Dutch Leeward Islands.

Cnemidophorus murinus murinus (LAURENTI)

Seps murinus LAURENTI, Synops. Reptil., 1768, p. 63 (type locality, Guiana, probably incorrect).

Cnemidophorus murinus WIEGMANN, Herpetologia Mexicana, 1834, p. 27.

Cnemidophorus murinus murinus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 31.

Cnemidophorus ocellifer (SPIX)

Tejus ocellifer SPIX, Spec. Novae Lacert. Bras., 1825, p. 23 (type locality, Bahia, Brazil).

Cnemidophorus ocellifer PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 414.

RANGE: Brazil, Paraguay, and Bolivia.

Genus Colobosaura[1]

BOULENGER, Cat. Liz. British Mus., Vol. 3, 1887, p. 508
(type species, *modesta*)

Colobosaura kraepelini (WERNER)

Perodactylus kraepelini WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 32 (type locality, Puerto Max, northern Paraguay).

RANGE: Paraguay.

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[1] This is a new generic name given by Boulenger (Cat. Liz. British Mus., Vol. 3, 1887, p. 508) to *Perodactylus* Reinhardt and Lütken (Vidensk. Meddel. Nat. Foren Kjobenh., 1861, p. 218, type species, *modesta*) which he found preoccupied by a genus of geckos.

Colobosaura modesta (REINHARDT AND LÜTKEN)

Perodactylus modestus REINHARDT and LÜTKEN, Vidensk. Meddel. Nat. Foren. Kjobenh., 1861, p. 218 (type locality, Morro de Garza, Brazil).

Colobosaura modesta BOULENGER, Cat. Liz. British Mus., Vol. 3, 1887, p. 508.

RANGE: Brazil.

Genus **Crocodilurus**

SPIX, Spec. Novae Lacert. Bras., 1825, p. 19 (type species, *amazonicus*=*lacertinus*)

Crocodilurus lacertinus (DAUDIN)

Tupinambis lacertinus DAUDIN, Hist. Nat. des Reptiles, Vol. 3, 1802, p. 85 (type locality, South American Islands).

Crocodilurus lacertinus DUMÉRIL and BIBRON, Vol. 5, 1839, p. 46.

RANGE: Central and northern South America.

Genus **Dicrodon**

DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 137 (type species, *guttulatum*)

Dicrodon guttulatum DUMÉRIL and BIBRON

Dicrodon guttulatum DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 138 (type locality, Peru).

RANGE: Peru.

Dicrodon heterolepis (TSCHUDI)

Cnemidophorus heterolepis TSCHUDI, Fauna Peruana, Herpet., 1845, p. 40 (type locality, high woods in the Andes of eastern Peru).

RANGE: Peruvian Andes.

Dicrodon lentiginosus (GARMAN)

Cnemidophorus lentiginosus GARMAN, Bull. Essex Inst., Vol. 24, 1892, p. 92 (type locality, San Francisco de Psojorja, Ecuador).

Dicrodon barbouri NOBLE, Occas. Pap. Boston Soc. Nat. Hist., Vol. 5, 1924, p. 108 (type locality, Chira River, Sullana, northwestern Peru).

Dicrodon lentiginosus lentiginosus BARBOUR and LOVERIDGE, Bull. Mus. Comp. Zool., Vol. 69, 1929, p. 242.

RANGE: Peru and Ecuador.

Genus **Dracaena**

DAUDIN, Hist. Nat. des Reptiles, Vol. 2, 1802, p. 421
(type species, *guianensis*)

Dracaena guianensis DAUDIN

Dracaena guianensis DAUDIN, Hist. Nat. des Reptiles, Vol. 2, 1802, p. 423 (type locality, Saint Francois River, Brazil).

RANGE: Northeastern South America.

Genus **Echinosaura**

BOULENGER, Proc. Zool. Soc. London, 1890, p. 82
(type species, *horrida*)

Echinosaura horrida BOULENGER

Echinosaura horrida BOULENGER, Proc. Zool. Soc. London, 1890, p. 83 (type locality, Ecuador).

RANGE: Ecuador.

Echinosaura palmeri BOULENGER

Echinosaura palmeri BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 23 (type locality, Noananca, Rio San Juan, Choco of southwestern Colombia.

RANGE: Colombia.

Genus **Ecpleopus**

DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 434
(type species, *gaudichaudii*)

Ecpleopus affinis PETERS

Ecpleopus (Aspidolaemus) affinis PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 199 (type locality, South America).

RANGE: Western Ecuador.

Ecpleopus gaudichaudii DUMÉRIL and BIBRON

Ecpleopus gaudichaudii DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 436 (type locality, Brazil).

RANGE: Brazil.

Genus **Euspondylus**[1]

TSCHUDI, Fauna Peruana, Herpet., 1845, p. 41
(type species, *maculatus*)

Euspondylus acutirostris (PETERS)

Ecpleopus (Euspondylus) acutirostris PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 209 (type locality, Venezuela).

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[1] Including *Prionodactylus* O'Shaughnessy, Proc. Zool. Soc., London, 1881, p. 231 (type species, *manicatus*).

Euspondylus acutirostris BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 407.

RANGE: Venezuela and eastern Colombia.

Euspondylus argulus (PETERS)

Cercosaura (Pantodactylus) argulus PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 184 (type locality, Santa Fe de Bogota, Colombia).

Prionodactylus argulus GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 428.

RANGE: Colombia.

Euspondylus bolivianus (WERNER)

Prionodactylus bolivianus WERNER, Zool. Anz., Vol. 22, 1899, p. 481 (type locality, Chaco, Bolivia).

Prionodactylus eigenmanni GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 316 (type locality, Province of Sara, Bolivia).

RANGE: Bolivia.

Euspondylus brevifrontalis BOULENGER

Euspondylus brevifrontalis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 12, 1903, p. 431 (type locality, Rio Albirregas and Escorial, Venezuela).

RANGE: Venezuela.

Euspondylus champsonatus (WERNER)

Prionodactylus champsonatus WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 31 (type locality, Itapocú, District of Jaraguá, Santa Catharina, Brazil).

RANGE: Southern Brazil and Bolivia.

Euspondylus columbiensis (WERNER)

Prionodactylus columbiensis WERNER, Zool. Anz., Vol. 47, 1916, p. 307 (type locality, Canyon of Tolima, Colombia).

RANGE: Colombia.

Euspondylus cupreus ANDERSSON

Euspondylus cupreus ANDERSSON, Göteborgs Kungl. Vetenskaps- och Vitterhetssamhalles Handl., Sect. 4, Vol. 17, No. 5, p. 6 (type locality, Brazil).

RANGE: Brazil.

Euspondylus festae PERACCA

Euspondylus festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 300, 1897, p. 10 (type locality, Valle del Rio Zamora and Valle del Rio Santiago, Ecuador).

RANGE: Ecuador.

Euspondylus guentheri (O'SHAUGHNESSY)

Ecpleopus (Euspondylus) guentheri O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 235 (type locality, Sarayacu, Ecuador).

RANGE: Ecuador.

Euspondylus leucostictus (BOULENGER)

Prionodactylus leucostictus BOULENGER, Trans. Linn. Soc. London, Ser. 2, Vol. 8, 1900, p. 54 (type locality, summit of Mount Roriama).

RANGE: Northeastern South America.

Euspondylus maculatus TSCHUDI

Euspondylus maculatus TSCHUDI, Fauna Peruana, Herpet., 1845, p. 42 (type locality, Moyobamba, Peru).

RANGE: Northern Peru and southern Ecuador.

Euspondylus manicatus (O'SHAUGHNESSY)

Cercosaura (Prionodactylus) manicata O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 231 (type locality, Canelos and Pallatanga, Ecuador).

Prionodactylus manicatus GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 428.

RANGE: Ecuador.

Euspondylus ocellifer (WERNER)

Prionodactylus ocellifer WERNER, Verhandl. k.k. zool.-bot. Ges. Wien, Vol. 51, 1901, p. 596 (type locality, Ecuador).

RANGE: Ecuador.

Euspondylus ockendeni holmgreni (ANDERSSON)

Prionodactylus holmgreni ANDERSSON, Arkiv f. Zool., Vol. 9, No. 3, 1914, p. 9 (type locality, San Fermin, northwest Bolivia).

Euspondylus ockendeni holmgreni BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 32.

RANGE: Bolivia.

Euspondylus ockendeni ockendeni (BOULENGER)

Prionodactylus ockendeni BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 19, 1907, p. 486 (type locality, Carabaya, eastern Peru).

Prionodactylus spinalis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 7, 1911, p. 23 (type locality, Huancabamba, Peru).

Euspondylus ockendeni ockendeni BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 32.

RANGE: Peru.

Euspondylus oshaughnessyi (BOULENGER)

Prionodactylus oshaughnessyi BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 392 (type locality, Canelos and Pallatanga, Ecuador).

RANGE: Ecuador.

Euspondylus palmeri (BOULENGER)

Prionodactylus palmeri BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 11, 1908, p. 518 (type locality, San Antonio, Colombia).

RANGE: Colombia.

Euspondylus quadrilineatus (BOETTGER)

Cercosaura (Pantodactylus) quadrilineatus BOETTGER, Ber. Senckenb. Ges., 1876, p. 141 (type locality, Sao Paulo, Brazil).

Prionodactylus quadrilineatus GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 428.

Prionodactylus albostrigatus GRIFFIN, Ann. Carnegie Mus., Vol. 11, 1917, p. 314 (type locality, Sete Lagoas, Minas Geraes, Brazil).

RANGE: Southern Brazil.

Euspondylus simonsii BOULENGER

Euspondylus simonsii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 7, 1901, p. 549 (type locality, Puntoyacu, Perené River, central Peru).

RANGE: Peru.

Euspondylus stenolepis BOULENGER

Euspondylus stenolepis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 2, 1908, p. 519 (type locality, San Antonio, Colombia).

RANGE: Colombia.

Euspondylus strangulatus COPE

Euspondylus strangulatus COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 99 (type locality, Ecuador).

RANGE: Ecuador.

Euspondylus vertebralis (O'SHAUGHNESSY)

Cercosaura (Pantodactylus) vertebralis O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 4, 1879, p. 298 (type locality, Intac, Ecuador.

Prionodactylus vertebralis BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 394.

Prionodactylus marianus RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 103, 1921, p. 1 (type locality, Medellin, Colombia).

Euspondylus vertebralis BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 33.

RANGE: Ecuador and Colombia.

Genus **Gymnophthalmus**

MERREM, Syst. Amph., 1820, p. 74 (type species, *quadrilineatus=lineatus*)

Gymnophthalmus laevicaudus (COPE)

Tretioscincus laevicaudus COPE, Proc. Amer. Philos. Soc., Vol. 11, 1870, p. 557 (type locality, Occidental Department, Nicaragua).

Epaphelus sumichrastii COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 115 (type locality, Costa Rica).

Gymnophthalmus sumichrasti BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 428.

Gymnophthalmus laevicaudus COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 46.

RANGE: Western America from central Chile, north to southern Mexico.

Gymnophthalmus lineatus (LINNAEUS)

Lacerta lineata LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 209 (type locality, Zeilona).

Lacerta quadrilineata LINNAEUS, Syst. Nat., Ed. 12, Vol. 1, 1766 (type locality, North America?).

Gymnophthalmus quadrilineatus MERREM, Syst. Amph., 1820, p. 74.

Gymnophthalmus lineatus ANDERSSON, Bihang Svenska Vet.-Akad. Handl., Vol. 26, 1900, Sect. 4, No. 1, p. 16.

RANGE: Brazil, northeastern South America, and the Dutch Leeward Islands.

Gymnophthalmus rubricaudus BOULENGER

Gymnophthalmus rubricaudus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 9, 1902, p. 337 (type locality, Cruz del Eje, Argentina).

RANGE: Northern Argentina and Bolivia.

Genus **Heterodactylus**

SPIX, Spec. Novae Lacert, Bras., 1825, p. 25 (type species, *imbricatus*)

Heterodactylus imbricatus SPIX

Heterodactylus imbricatus SPIX, Spec. Novae Lacert. Bras., 1825, p. 25 (type locality, Brazil).

RANGE: Brazil.

Heterodactylus lundii REINHARDT and LÜTKEN

Heterodactylus lundii REINHARDT and LÜTKEN, Vidensk. Meddel. Nat. Foren Kjöbenh., 1861, p. 214 (type locality, Serra do Piedade, Brazil).

RANGE: Brazil.

Genus **Iphisa**

GRAY, Proc. Zool. Soc. London, 1851, p. 39 (type species, *elegans*)

Iphisa elegans GRAY

Iphisa elegans GRAY, Proc. Zool. Soc. London, 1851, p. 39 (type locality, Pará, northern Brazil).

RANGE: Northeastern South America.

Genus **Kentropyx**[1]

SPIX, Spec. Novae Lacert, Bras., 1825, p. 21 (type species, *calcaratus*)

Kentropyx altamazonicus COPE

Centropyx altamazonicus COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 162 (type locality, Moyobamba, Peru).

RANGE: Peru.

Kentropyx calcaratus SPIX

Kentropyx calcaratus SPIX, Spec. Novae Lacert. Bras., 1825, p. 21 (type locality, Itapicurú, Brazil).

Monoplocus dorsalis GUNTHER, Proc. Zool. Soc. London, 1859, p. 404 (type locality, western Ecuador).

Centropyx pelviceps COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 98 (type locality, Napo or Upper Amazon, Ecuador).

RANGE: Northern and western South America.

Kentropyx intermedius (GRAY)

Teius (Centropyx) intermedius GRAY, Synops. Reptil., in Griffith, "Cuvier's Animal Kingdom", 1831, p. 31 (type locality, Surinam).

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[1] Including *Monoplocus* Günther, Proc. Zool. Soc. London, 1859, p. 404 (type species, *dorsalis*).

Centropyx intermedius BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 340.

Centropyx copii GARMAN, Bull. Essex Inst., Vol. 19, 1887, p. 2 (type locality, not given).

Gastropholis mertensi DE GRIJS, Mitt. Zool. Staatinst. Hamburg, Vol. 42, 1926, p. 37 (type locality, Wari, Niger-Delta, Africa, in error).

RANGE: Northeastern South America.

Kentropyx paulensis BOETTGER

Kentropyx paulensis BOETTGER, Kat. Reptil. Samml. Mus. Senckenb. Naturf. Ges., Pt. 1, 1892, p. 73 (type locality, Sao Paulo, Brazil).

RANGE: Southern Brazil.

Kentropyx striatus (DAUDIN)

Lacerta striata DAUDIN, Hist. Nat. des Reptiles, Vol. 3, 1802, p. 247 (type locality, Surinam).

Centropyx striatus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 340.

RANGE: Northeastern South America.

Kentropyx viridistriga BOULENGER

Centropyx virdistriga BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 13, 1894, p. 343 (type locality, Asuncion, Paraguay).

RANGE: Paraguay.

Kentropyx williamsoni RUTHVEN

Kentropyx williamsoni RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 206, 1929, p. 1 (type locality, Manaos, Brazil).

RANGE: Brazil.

Genus Leposoma[1]

SPIX, Spec. Novae Lacert. Bras., 1825, p. 24 (type species, *scincoides*)

Leposoma dispar PETERS

Leposoma dispar PETERS, Monatsb. Akad. Wiss. Berlin, 1880, p. 309 (type locality, Caceres, Colombia).

Leposoma southi RUTHVEN and GAIGE, Occas. Pap. Mus. Zool. Univ. Mich., No. 147, 1924, p. 1 (type locality, Progreso, Chiriqui Province, Panama).

RANGE: Colombia, northward into Central America.

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[1] Including *Hylosaurus* Müller, Zool. Anz., Vol. 57, 1923, p. 145 (type species, *percarinatus*).

Leposoma percarinatum (MÜLLER)

Hylosaurus percarinatus MÜLLER, Zool. Anz., Vol. 57, 1923, p. 146 (type locality, Peixeboi, State of Pará, northeastern Brazil).

Leposoma taeniata NOBLE, Zoologica, Vol. 3, No. 15, 1923, p. 303 (type locality, Kartabo, British Guiana).

Hylosaurus muelleri MERTENS, Senckenbergiana, Vol. 7, 1925, p. 76 (type locality, Inirida River, southern Venezuela).

RANGE: Northeastern South America.

Leposoma scincoides SPIX

Leposoma scincoides SPIX, Spec. Novae Lacert. Bras., 1825, p. 24 (type locality, Brazil).

RANGE: Brazil.

Genus **Macropholidus**

NOBLE, Ann. N. Y. Acad. Sci., Vol. 29, 1921, p. 138
(type species, *ruthveni*)

Macropholidus annectens PARKER

Macropholidus annectens PARKER, Ann. and Mag. Nat. Hist., Ser. 10, Vol. 5, 1930, p. 569 (type locality, Loja City, Ecuador).

RANGE: Southern Ecuador.

Macropholidus ruthveni NOBLE

Macropholidus ruthveni NOBLE, Ann. N. Y. Acad. Sci., Vol. 29, 1921, p. 137 (type locality, mountains on the boundary between the departments of Piura and Cajamarca, northwestern Peru).

RANGE: Northwestern Peru.

Genus **Micrablepharus**

BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, p. 217
(type species, *glaucurus*=*maximiliani*)

Micrablepharus maximiliani (REINHARDT AND LÜTKEN)

Gymnophthalmus maximiliani REINHARDT and LÜTKEN, Vidensk. Meddel. Nat. Foren Kjöbenh., 1861, p. 211 (type locality, Brazil).

Micrablepharus maximiliani BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 426.

RANGE: Brazil and Paraguay.

Genus **Mionyx**

COPE, Proc. Amer. Philos. Soc., Vol. 23, 1885, p. 96
(type species, *parietalis*)

Mionyx parietalis COPE

Mionyx parietalis COPE, Proc. Amer. Philos. Soc., Vol. 23, 1885, p. 96 (type locality, Pebas, eastern Ecuador).

RANGE: Ecuador.

Genus **Neusticurus**

DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 61
(type species, *bicarinatus*)

Neusticurus bicarinatus (LINNAEUS)

Lacerta bicarinata LINNAEUS, Syst. Nat., ed. 10, 1758, p. 201 (type locality, "Indiis").

Neusticurus bicarinatus DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 64.

RANGE: Brazil.

Neusticurus dejongi BRONGERSMA

Neusticurus dejongi BRONGERSMA, Ann. and Mag. Nat. Hist., Ser. 9, Vol. 20, 1927, p. 543 (type locality, Surinam).

RANGE: Northeastern South America.

Neusticurus ecpleopus cochranae BURT and BURT

Neusticurus ecpleopus cochranae BURT and BURT, Bull. Amer. Mus. Nat. Hist., Vol. 61, 1931, p. 350 (type locality, San José de Sumaco, Ecuador).

RANGE: Northern Ecuador.

Neusticurus ecpleopus ecpleopus COPE

Neusticurus ecpleopus COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 161 (type locality, Peru).

RANGE: Northern Peru and southern and central Ecuador.

Neusticurus ecpleopus ocellatus SINITSIN

Neusticurus ocellatus SINITSIN, Amer. Mus. Novitates, No. 408, 1930, p. 1 (type locality, Rurrenabaque, Bolivia).

RANGE: Bolivia and southern and central Peru.

Neusticurus rudis BOULENGER

Neusticurus rudis BOULENGER, Trans. Linn. Soc. London, Ser. 2, Vol. 8, 1900, p. 53 (type locality, foot of Mount Roraima).

RANGE: Northeastern South America.

Neusticurus surinamensis MÜLLER

Neusticurus surinamensis MÜLLER, Zool. Anz., Vol. 58, 1923, p. 295 (type locality, Albina, near the mouth of the Maroni River, Surinam).

RANGE: Northeastern South America.

Genus **Ophiognomon**

COPE, Proc. Acar. Nat. Sci. Phila., 1868, p. 100
(type species, *trisanale*)

Ophiognomon abendrothii (PETERS)

Chalcides (Hapalolepis) abendrothii PETERS, Monatsb. Akad. Wiss. Berlin, 1871, p. 399 (type locality, Sarayacu, Ecuador).

Ophiognomon abendrothii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 421.

RANGE: Ecuador.

Ophiognomon trisanale COPE

Ophiognomon trisanale COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 100 (type locality, Napo or Upper Maranon).

RANGE: Basin of the Upper Amazon.

Ophiognomon vermiforme (COPE)

Propus vermiformis COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 100 (type locality, Nauta, Peru).

Ophiognomon vermiforme BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 421.

RANGE: Peru.

Genus **Pantodactylus**[1]

DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 428
(type species, *dorbignyi=schreibersii*)

Pantodactylus amazonius (RUTHVEN)

Alopoglossus amazonius RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 153, 1924, p. 1 (type locality, Villa Murtinho, Matto Grosso, Brazil).

RANGE: Province of Matto Grosso, Brazil.

Pantodactylus buckleyi buckleyi (O'SHAUGHNESSY)

Leposoma buckleyi O'SHAUGHNESSY, Proc. Zool. Soc. London, 1881, p. 233 (type locality, Canelos, Ecuador).

Alopoglossus buckleyi BOULENGER, Cat. Liz. British Mus., Vol 2, 1885, p. 385.

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[1] Including *Loxopholis* Cope, Proc. Acad. Nat. Sci. Phila., 1868, p. 305 (type species, *rugiceps*) and *Alopoglossus* Boulenger, Cat. Liz. British Mus., Vol. 2, 1885, p. 383 (type species, *buckleyi*).

Pantodactylus buckleyi buckleyi BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 35.
RANGE: Central and eastern Ecuador.

Pantodactylus buckleyi festae (PERACCA)

Alopoglossus festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 19, No. 465, 1904, p. 7 (type locality, Vinces, Ecuador).
RANGE: Western Ecuador.

Pantodactylus carinicaudatus (COPE)

Leposoma carinicaudatum COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 160 (type locality, Valley of the Maranon River).
RANGE: Valley of the Maranon River.

Pantodactylus copii (BOULENGER)

Alopoglossus copii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 383 (type locality, Pallatanga and Canelos, Ecuador).
RANGE: Eastern and central Ecuador.

Pantodactylus gracilis (WERNER)

Alopoglossus gracilis WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 30, Pt. 2, 1913, p. 13 (type locality, Valley of the Rio Humboldt, tributary of the Rio Itapocú, Santa Catharina, Brazil).
RANGE: Southeastern Brazil.

Pantodactylus nicefori BURT and BURT

Pantadactylus nicefori BURT and BURT, Bull. Amer. Mus. Nat. Hist., Vol. 61, 1931, p. 360 (type locality, Bogota, Colombia).
RANGE: Colombia.

Pantodactylus rugiceps (COPE)

Loxopholis rugiceps COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 305 (type locality, Magdalena River, Colombia).
RANGE: Colombia and Panama.

Pantodactylus schreibersii (WIEGMANN)

Cercosaura schreibersii WIEGMANN, Herpetologia Mexicana, 1834, p. 10 (type locality, Brazil).
Pantodactylus schreibersii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 388.
RANGE: Brazil, Uruguay, Paraguay, and Argentina.

Pantodactylus tyleri BURT and BURT

Pantodactylus tyleri BURT and BURT, Bull. Amer. Mus. Nat. Hist., Vol. 61, 1931, p. 362 (type locality, summit of Mount Duida, Venezuela).
RANGE: Venezuela and eastern Colombia.

Genus **Pholidobolus**

PETER, Abhandl. Akad. Wiss. Berlin, 1862, p. 165
(type species, *montium*)

Pholidobolus anomalus MÜLLER

Pholidobolus anomalus MÜLLER, Zool. Anz., Vol. 57, 1923, p. 52 (type locality, Cuzco, Peru).

RANGE: Peru.

Pholidobolus montium (PETERS)

Ecpleopus (Pholidobolus) montium PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 196 (type locality, Quito, Ecuador).

Pholidobolus montium BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 403.

RANGE: Ecuador.

Genus **Placosoma**

TSCHUDI, Arch. f. Naturg., Vol. 13, Pt. 1, 1847, p. 50
(type species, *cordylinum*)

Placosoma cordylinum TSCHUDI

Placosoma cordylinum TSCHUDI, Arch. f. Naturg., Vol. 13, Pt. 1, 1847, p. 51 (type locality, northern Brazil).

RANGE: Brazil.

Genus **Proctoporus**[1]

TSCHUDI, Fauna Peruana, Herpet., 1845, p. 43
(type species, *pachyurus*)

Proctoporus anomalus (BARBOUR AND NOBLE)

Oreosaurus anomalus BARBOUR and NOBLE, Proc. U. S. Nat. Mus., Vol. 58, 1920, p. 614 (type locality, San Fernando, Rio San Miguel, southern Peru).

Proctoporus anomalus BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, p. 36.

RANGE: Southern and central Peru.

Proctoporus bicolor (WERNER)

Gonioptychus bicolor WERNER, Zool. Anz., Vol. 47, 1916, p. 305 (type locality, Canyon of Tolima, Colombia).

RANGE: Colombia.

Proctoporus columbianus ANDERSSON

Proctoporus columbianus ANDERSSON, Arkiv f. Zool., Vol. 9, No. 3, 1914, p. 3 (type locality, Colombia).

RANGE: Colombia.

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[1] Including *Oreosaurus* Peters, Abhandl. Akad. Wiss. Berlin, 1862, p. 201 (type species, *luctuosus*) and *Gonioptychus* Werner, Zool. Anz., Vol. 47, 1916, p. 305 (type species, *bicolor*).

Proctoporus guentheri (BOETTGER)

Oreosaurus guentheri BOETTGER, Zool. Anz., Vol. 14, 1891, p. 345 (type locality, Sorata, Bolivia).

Proctoporus bolivianus WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, p. 30 (type locality, Sorata, Bolivia).

RANGE: Western Bolivia.

Proctoporus hypostictus BOULENGER

Proctoporus hypostictus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 9, 1902, p. 55 (type locality, Paramba, northwestern Ecuador).

RANGE: Northwestern Ecuador.

Proctoporus laevis (BOULENGER)

Oreosaurus laevis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 2, 1908, p. 521 (type locality, San Antonio, Colombia).

RANGE: Colombia.

Proctoporus luctuosus (PETERS)

Ecpleopus (Oreosaurus) luctuosus PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 203 (type locality, Venezuela).

RANGE: Venezuela.

Proctoporus meleagris BOULENGER

Proctoporus meleagris BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 415 (type locality, western Ecuador).

RANGE: Ecuador.

Proctoporus ocellifer (BOULENGER)

Oreosaurus ocellifer BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 10, 1902, p. 400 (type locality, Marcapata Valley, eastern Peru).

RANGE: Southern and central Peru.

Proctoporus oculatus (O'SHAUGHNESSY)

Ecpleopus oculatus O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 4, 1879, p. 297 (type locality, Intac, Ecuador).

Proctoporus oculatus COPE, Proc. Amer. Philos. Soc., Vol. 23, 1885, p. 98.

Proctoporus lividus THOMINOT, Bull. Soc. Philom, Paris, Ser. 8, Vol. 1, 1889, p. 25 (type locality, unknown).

RANGE: Ecuador.

Proctoporus pachyurus TSCHUDI

Proctoporus pachyurus TSCHUDI, Fauna Peruana, Herpet., 1845,

p. 43 (type locality, Chanchamayo River, eastern slope of the Andes, central Peru).

RANGE: Peru.

Proctoporus petersi (BOETTGER)

Ecpleopus (Oreosaurus) petersi BOETTGER, Ber. Offenbach. Ver. f. Naturk., Nos. 17 and 18, 1878, p. 9 (type locality, Province of Pará, Brazil, no doubt in error).

Oreosaurus petersii BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 411.

Oreosaurus lacertus STEJNEGER, Proc. U. S. Nat. Mus., Vol. 45, 1913, p. 546 (type locality, Tincochchaca, Peru).

Proctoporus longicaudatus ANDERSSON, Arkiv f. Zool. Vol. 9, No. 3, 1914, p. 6 (type locality, Pelechucio, western Bolivia).

Proctoporus obesus BARBOUR and NOBLE, Proc. U. S. Nat. Mus., Vol. 58, 1920, p. 616 (type locality, Nusta Hispana, southern Peru).

Proctoporus petersi BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 36.

RANGE: Southern Peru, western Bolivia, and possibly northern Chile.

Proctoporus simoterus (O'SHAUGHNESSY)

Emphrassotis simoterus O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., Ser. 5, Vol. 4, 1879, p. 296 (type locality, Intac, Ecuador).

Proctoporus simoterus BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 414.

RANGE: Ecuador.

Proctoporus striatus (PETERS)

Ecpleopus (Oreosaurus) striatus PETERS, Abhandl. Akad. Wiss. Berlin, 1862, p. 201 (type locality, Santa Fé de Bogotá, Colombia).

Proctoporus striatus COPE, Proc. Amer. Philos. Soc., Vol. 23, 1885, p. 98.

Proctoporus bogotensis BOULENGER, Proc. Zool. Soc. London, 1919, p. 80 (type locality, Bogota, Colombia).

RANGE: Colombia.

Proctoporus unicolor (GRAY)

Riama unicolor GRAY, Proc. Zool. Soc. London, 1858, p. 446 (type locality, western Ecuador).

Proctoporus unicolor BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 413.

RANGE: Ecuador.

Proctoporus ventrimaculatus BOULENGER

Proctoporus ventrimaculatus BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 6, 1900, p. 185 (type locality, Cajamarca, Peru).

RANGE: Northern Peru.

Genus **Ptychoglossus**[1]

BOULENGER, Proc. Zool. Soc. London, 1890, p. 83
(type species, *bilineatus*=*picticeps*)

Ptychoglossus brevifrontalis BOULENGER

Ptychoglossus brevifrontalis BOULENGER, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 10, 1912, p. 421 (type locality, El Topo, Rio Pastaza, eastern Ecuador).

RANGE: Eastern Ecuador.

Ptychoglossus festae (PERACCA)

Diastemalepis festae PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 11, No. 235, 1896, p. 2 (type locality, Rio Cianati, Darien, Panama).

RANGE: Colombia, northward into Central America.

Ptychoglossus kugleri ROUX

Ptychoglossus kugleri ROUX, Verhandl. Naturf. Ges. Basel, Vol. 38, 1927, p. 256 (type locality, El Mene, Province of Falcon, Venezuela).

RANGE: Venezuela.

Ptychoglossus picticeps (COPE)

Leposoma picticeps COPE, Proc. Amer. Philos. Soc., Vol. 23, 1885, p. 99 (type locality, Pebas, Upper Amazon, eastern Ecuador).

Ptychoglossus bilineatus BOULENGER, Proc. Zool. Soc. London, 1890, pp. 79, 84 (type locality, Ecuador).

RANGE: Ecuador.

Genus **Scolecosaurus**

BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 416
(type species, *cuvieri*)

Scolecosaurus cuvieri (DUMÉRIL AND BIBRON)

Chalcides cuvieri DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 453 (type locality, not given).

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[1] Including *Diastemalepis* Peracca, Boll. Mus. Zool. Univ. Torino, Vol. 11, No. 325, 1896, p. 1 (type species, *festae*).

Scolecosaurus cuvieri BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 416.

Scolecosaurus alleni BARBOUR, Mem. Mus. Comp. Zool., Vol. 44, 1914, p. 315 (type locality, St. George's, Island of Grenada).

RANGE: Grenada.

Scolecosaurus pallidiceps (COPE)

Brachypus pallidiceps COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 356 (type locality, Truando River region, Colombia).

Scolecosaurus pallidiceps BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 417.

RANGE: Colombia.

Scolecosaurus trinitatis BARBOUR

Scolecosaurus trinitatis BARBOUR, Mem. Mus. Comp. Zool., Vol. 44, 1914, p. 316 (type locality, Caparo, Trinidad).

RANGE: Trinidad, and probably the mainland of northeastern South America.

Genus **Stenolepis**

BOULENGER, Proc. Zool. Soc. London, 1887, p. 640
(type species, *ridleyi*)

Stenolepis ridleyi BOULENGER

Stenolepis ridleyi BOULENGER, Proc. Zool. Soc. London, 1887, p. 640 (type locality, forest of Iguarasse, Pernambuco, Brazil).

RANGE: Brazil.

Genus **Teius**

MERREM, Syst. Amph., 1820, p. 60 (type species, *viridis=teyou*)

Teius teyou cyanogaster MÜLLER

Teius teyou cyanogaster MÜLLER, Zool. Anz., Vol. 77, 1928, p. 69 (type locality, San Jose de Chiquiros, Bolivia).

RANGE: Bolivia and northern Argentina.

Teius teyou teyou (DAUDIN)

Lacerta teyou DAUDIN, Hist. Nat. des Reptiles, Vol. 3, 1802, p. 195 (type locality, Paraguay).

Teius teyou BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 379.

Teius teyou teyou BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art 6, 1930, p. 37.

RANGE: Paraguay, southeastern Brazil, eastern and central Argentina.

Genus **Tretioscincus**

COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 184
(type species, *bifasciatus*)

Tretioscincus bifasciatus (DUMÉRIL)

Heteropus bifasciatus DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 182 (type locality, Valley of the Rio Magdalena, Colombia).

Tretioscincus bifasciatus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 229.

RANGE: Colombia.

Genus **Tupinambis**

DAUDIN, Hist. Nat. des Reptiles, Vol. 3, 1802, p. 6
(type species, *monitor=teguixin*)

Tupinambis duséni LOENNBERG

Tupinambis duséni LOENNBERG, Arkiv f. Zool., Vol. 6, No. 9, 1910, p. 1 (type locality, Paraná, Brazil).

RANGE: Southern Brazil.

Tupinambis nigropunctatus SPIX

Tupinambis nigropunctatus SPIX, Spec. Novae Lacert. Bras., 1825, p. 18 (type locality, Brazil).

RANGE: Central and northern South America.

Tupinambis rufescens (GÜNTHER)

Tejus rufescens GÜNTHER, Proc. Zool. Soc. London, 1871, p. 541 (type locality, Mendoza, Argentina).

Tupinambis rufescens BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 335.

RANGE: Argentina.

Tupinambis teguixin (LINNAEUS)

Lacerta teguixin LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 208 (type locality, "Indiis").

Tupinambis teguixin BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 335.

RANGE: Central and northern South America.

AMPHISBAENIDAE (*FAMILY*)

Genus Amphisbaena

LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 229
(type species, *fuliginosa*)

Amphisbaena alba LINNAEUS

Amphisbaena alba LINNAEUS, Syst. Nat., Ed. 10, 1758, 229 (type locality, America).

RANGE: South America, with the exception of the southern part.

Amphisbaena albocingulata BOETTGER

Amphisbaena albocingulata BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, p. 215 (type locality, Paraguay).

RANGE: Paraguay.

Amphisbaena beniensis COPE

Amphisbaena beniensis COPE, Proc. Amer. Philos. Soc., Vol. 22, 1885, pp. 184, 188 (type locality, Upper Beni River, Bolivia).

RANGE: Bolivia.

Amphisbaena bohlsii BOULENGER

Amphisbaena bohlsii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 6, Vol. 13, 1894, p. 344 (type locality, Asuncion, Paraguay).

RANGE: Paraguay.

Amphisbaena boliviana WERNER

Amphisbaena boliviana WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 35 (type locality, source of the Amazon, Province of Beni, Bolivia).

RANGE: Bolivia.

Amphisbaena borelli PERACCA

Amphisbaena borelli PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 12, No. 274, 1897, p. 8 (type locality, Caiza, Chaco of Bolivia).

RANGE: Bolivia.

Amphisbaena boulengeri MASI

Amphisbaena boulengeri MASI, Bull. Soc. Zool. Ital. Roma, Vol. 12, 1911, p. 232 (type locality, Provenienza, Cerro Santa Ana, Argentina).

RANGE: Argentina.

Amphisbaena brasiliana GRAY

Amphisbaena brasiliana GRAY, Proc. Zool. Soc. London, 1865, p. 448 (type locality, Santarem, Brazil).

RANGE: Brazil.

Amphisbaena camura bolivica MERTENS

Amphisbaena camura bolivica MERTENS, Zool. Anz., Vol. 86, 1929, p. 60 (type locality, Villa Montes, Rio Pilcomayo, southern Bolivia).

RANGE: Southern Bolivia.

Amphisbaena camura camura COPE

Amphisbaena camura COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 350 (type locality, Paraguay).

RANGE: Paraguay.

Amphisbaena carruccii MASI

Amphisbaena carruccii MASI, Bull. Soc. Zool. Ital. Roma, Vol. 12, 1911, p. 230 (type locality, Provenienza, Cerro Santa Ana, Argentina).

RANGE: Argentina.

Amphisbaena darwinii DUMÉRIL and BIBRON

Amphisbaena darwinii DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 490 (type locality, Montevideo, Uruguay).

Amphisbaena angustifrons COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 70 (type locality, Buenos Aires, Argentina).

RANGE: Argentina, Uruguay, Paraguay, Bolivia, and southern Brazil.

Amphisbaena dubia MÜLLER

Amphisbaena dubia MÜLLER, Mitt. Zool. Mus. Berlin, Vol. 11, 1924, p. 86 (type locality, Piracicaba, State of Sao Paulo, Brazil).

RANGE: Brazil.

Amphisbaena fuliginosa LINNAEUS

Amphisbaena fuliginosa LINNAEUS, Syst. Nat., Ed. 10, 1758, p. 229 (type locality, America).

RANGE: Northern half of South America.

Amphisbaena gracilis STRAUCH

Amphisbaena gracilis STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 391 (type locality, not given).

RANGE: South America.

Amphisbaena knighti PARKER

Amphisbaena knighti PARKER, Ann. and Mag. Nat. Hist., Ser. 10, Vol 2, 1928, p. 383 (type locality, Bonifacio, Argentina).

RANGE: Argentina.

Amphisbaena leucocephala PETERS

Amphisbaena leucocephala PETERS, Monatsb. Akad. Wiss. Berlin, 1878, p. 778 (type locality, Bahia, Brazil).

RANGE: Brazil.

Amphisbaena mattogrossensis PERACCA

Amphisbaena mattogrossensis PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 13, No. 326, 1898, p. 1 (type locality, Matto Grosso, Brazil).

RANGE: Brazil.

Amphisbaena mertensii STRAUCH

Amphisbaena mertensii STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 385 (type locality, not given).

RANGE: Paraguay.

Amphisbaena mildei PETERS

Amphisbaena mildei PETERS, Monatsb. Akad. Wiss. Berlin, 1878, p. 779 (type locality, Porto Alegre, Brazil).

RANGE: Brazil.

Amphisbaena mitchelli PROCTER

Amphisbaena mitchelli PROCTER, Proc. Zool. Soc. London, 1923, p. 1065 (type locality, Marajo Island, Mouth of the Amazon, Brazil).

RANGE: Marajo Island, Mouth of the Amazon, Brazil.

Amphisbaena occidentalis COPE

Amphisbaena occidentalis COPE, Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 8, 1876, p. 176 (type locality, Valley of Jequetepeque, northern Peru).

RANGE: Northern Peru.

Amphisbaena pericensis NOBLE

Amphisbaena pericensis NOBLE, Ann. N. Y. Acad. Sci., Vol. 29, 1921, p. 141 (type locality, Perico, Peru).

RANGE: Northwestern Peru.

Amphisbaena plumbea GRAY

Amphisbaena plumbea GRAY, Cat. Shield Reptil. British Mus., Vol. 2, 1872, p. 36 (type locality, Mendota, Argentina).

RANGE: Argentina.

Amphisbaena polygrammica WERNER

Amphisbaena polygrammica WERNER, Abhandl. u. Ber. Zool.

Anthr.-Ethn. Mus. Dresden, Vol. 9, No. 2, 1901, p. 5 (type locality, Chanchamayo, Peru).

RANGE: Peru.

Amphisbaena pretrii DUMÉRIL and BIBRON

Amphisbaena pretrii DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 486 (type locality, Brazil).

RANGE: Brazil.

Amphisbaena ridleyi BOULENGER

Amphisbaena ridleyi BOULENGER, Journ. Linn. Soc. London, Vol. 20, 1889, p. 481 (type locality, Island of Fernando do Noronha, east coast of Brazil).

RANGE: Island of Fernando do Noronha, east coast of Brazil.

Amphisbaena silvestrii BOULENGER

Amphisbaena silvestrii BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 9, 1902, p. 287 (type locality, Matto Grosso, Brazil).

RANGE: Brazil.

Amphisbaena slateri BOULENGER

Amphisbaena slateri BOULENGER, Ann. and Mag. Nat. Hist., Ser. 7, Vol. 19, 1907, p. 487 (type locality, Rio San Gaban Valley, Province of Carabaya, Peru).

RANGE: Peru.

Amphisbaena spurrelli BOULENGER

Amphisbaena spurrelli BOULENGER, Proc. Zool. Soc. London, 1915, p. 659 (type locality, Anda Goya, at the junction of the Rio Condoto and the Rio San Juan, southern Colombia).

RANGE: Colombia.

Amphisbaena stejnegeri RUTHVEN

Amphisbaena stejnegeri RUTHVEN, Occas. Pap. Mus. Zool. Univ. Mich., No. 122, 1922, p. 1 (type locality, Vreeden Rust, Demerara River, British Guiana).

RANGE: British Guiana.

Amphisbaena steindachneri STRAUCH

Amphisbaena steindachneri STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 407 (type locality, Caicara and Mattogrosso, Brazil).

RANGE: Brazil.

Amphisbaena subocularis PETERS

Amphisbaena subocularis PETERS, Monatsb. Akad. Wiss. Berlin, 1878, p. 779 (type locality, Pernambuco, Brazil).

RANGE: Brazil.

Amphisbaena townsendi STEJNEGER

Amphisbaena townsendi STEJNEGER, Proc. U. S. Nat. Mus., Vol. 41, 1911, p. 283 (type locality, Piura, Peru).

RANGE: Northwestern Peru.

Amphisbaena vermicularis SPIX

Amphisbaena vermicularis SPIX, Spec. Novae Serp. Bras., 1824, p. 73 (type locality, Province of Bahia, Brazil).

RANGE: Brazil.

Genus **Anopsibaena**[1]

STEJNEGER, Proc. Biol. Soc. Wash., Vol. 29, 1916, p. 96
(type species, *kingii*)

Anopsibaena kingii (BELL)

Anops kingii BELL, Proc. Zool. Soc. London, 1833, p. 99 (type locality, South America).

RANGE: Argentina.

Genus **Aulura**

BARBOUR, Proc. N. Eng. Zool. Club, Vol. 4, 1914, p. 96
(type species, *anomala*)

Aulura anomala BARBOUR

Aulura anomala BARBOUR, Proc. N. Eng. Zool. Club, Vol. 4, 1914, p. 96 (type locality, Brazil).

RANGE: Brazil.

Genus **Leposternon**

SPIX, Spec. Novae Serp. Bras., 1824, p. 70
(type species, *microcephalum*)

Leposternon affine BOETTGER

Lepidosternon affine BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, p. 223 (type locality, Paraguay).

RANGE: Paraguay.

Leposternon borelli PERACCA

Lepidosternon borelli PERACCA, Boll. Mus. Zool. Univ. Torino,

[1] This is a new generic name for *Anops* Bell, Proc. Zool. Soc. London, 1833, p. 99 (type species, *kingii*), which Stejneger has found to be preoccupied by the name given to a group of crustaceans.

Vol. 10, No. 195, 1895, p. 10 (type locality, Resistencia, Chaco of Argentina).

RANGE: Argentina.

Leposternon boulengeri BOETTGER

Lepidosternon boulengeri BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, p. 220 (type locality, Paraguay).

Leposternon boulengeri BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 41.

RANGE: Argentina and Paraguay.

Leposternon camerani PERACCA

Lepidosternon camerani PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 10, No. 195, 1895, p. 12 (type locality, Luque, Paraguay).

RANGE: Paraguay.

Leposternon carcani PERACCA

Lepidosternon carcani PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 19, No. 460, 1904, p. 5 (type locality, Tebicuari, Paraguay).

RANGE: Paraguay.

Leposternon crassum STRAUCH

Lepidosternon crassum STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 433 (type locality, Brazil).

RANGE: Brazil.

Leposternon guentheri STRAUCH

Lepidosternon guentheri STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 449 (type locality, unknown).

RANGE: South America.

Leposternon infraorbitale BERTHOLD

Lepidosternon infraorbitale BERTHOLD, Göttingen Nachr., 1859, p. 179 (type locality, Bahia, Brazil).

RANGE: Brazil.

Leposternon laticeps PERACCA

Lepidosternon laticeps PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 19, No. 460, 1904, p. 3 (type locality, Urucum, Paraguay).

RANGE: Paraguay.

Leposternon latifrontale BOULENGER

Lepidosternon latifrontale BOULENGER, Ann. and Mag. Nat. Hist.,

Ser. 6, Vol. 13, 1894, p. 345 (type locality, near Asuncion, Paraguay).

RANGE: Paraguay.

Leposternon microcephalum SPIX

Leposternon microcephalum SPIX, Spec. Novae Serp. Bras., 1824, p. 70 (type locality, Rio de Janeiro, Brazil).

RANGE: Brazil.

Leposternon octostegum DUMÉRIL

Lepidosternon octostegum DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 150 (type locality, Brazil).

RANGE: Brazil.

Leposternon onychocephalum BOETTGER

Lepidosternon onychocephalum BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, p. 224 (type locality, Paraguay).

RANGE: Paraguay.

Leposternon petersii STRAUCH

Lepidosternon petersii STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 438 (type locality, Brazil).

RANGE: Brazil.

Leposternon pfefferi WERNER

Lepidosternon pfefferi WERNER, Mitt. Naturh. Mus. Hamburg, Vol. 27, Pt. 2, 1910, p. 35 (type locality, Paraguay).

RANGE: Paraguay.

Leposternon phocaena DUMÉRIL and BIBRON

Lepidosternon phocaena DUMÉRIL and BIBRON, Erp. Gén., Vol. 5, 1839, p. 507 (type locality, Buenos Aires, Argentina).

RANGE: Argentina.

Leposternon polystegum DUMÉRIL

Lepidosternon polystegum DUMÉRIL, Cat. Méth. Coll. Reptiles, Paris, 1851, p. 149 (type locality, Bahia, Brazil).

RANGE: Brazil.

Leposternon rostratum STRAUCH

Lepidosternon rostratum STRAUCH, Mél. Biol. Acad. St. Petersburg, Vol. 11, 1881, p. 433 (type locality, Bahia, Brazil).

RANGE: Brazil.

Leposternon scutigerum (HEMPRICH)

Amphisbaena scutigera HEMPRICH, Verhandl. Ges. Naturf. Freunde Berlin, Vol. 1, 1820, p. 129 (type locality, Brazil).

Lepidosternon scutigerum BOULENGER, Cat. Liz. British Mus., Vol. 2, 1885, p. 469.

Leposternon scutigerum BURT and BURT, Proc. U. S. Nat. Mus., Vol. 78, Art. 6, 1930, p. 41.

RANGE: Brazil.

Leposternon sinuosum PERACCA

Lepidosternon sinuosum PERACCA, Boll. Mus. Zool. Univ. Torino, Vol. 10, No. 200, p. 1 (type locality, Brazil).

RANGE: Brazil.

Leposternon strauchii BOETTGER

Lepidosternon strauchii BOETTGER, Zeitschr. f. Naturw., Vol. 58, 1885, p. 221 (type locality, Paraguay).

RANGE: Paraguay.

Leposternon wuchereri PETERS

Lepidosternon wuchereri PETERS, Monatsb. Akad. Wiss. Berlin, 1879, p. 276 (type locality, Brazil).

RANGE: Brazil.

Genus **Mesobaena**

MERTENS, Senckenbergiana, Vol. 7, 1925, p. 170
(type species, *huebneri*)

Mesobaena huebneri MERTENS

Mesobaena huebneri MERTENS, Senckenbergiana, Vol. 7, 1925, p. 170 (type locality, Inirida, southern Venezuela).

RANGE: Venezuela.

SCINCIDAE (*FAMILY*)

Genus **Cryptoblepharus**

WIEGMANN, Herpetologia Mexicana, 1834, p. 12
(type species, *poecilopleurus*)

Cryptoblepharus boutonii poecilopleurus (WIEGMANN)

Ablepharus poecilopleurus WIEGMANN, Nova Acta Acad. Caes. Leop.-Carol., Vol. 17, Pt. 1, 1835, p. 202 (type locality, islands at Pisacoma, Peru).

Cryptoblepharus boutonii poecilopleurus STEJNEGER, Proc. U. S. Nat. Mus., Vol. 16, 1893, p. 722.

RANGE: Islands off west coast of Peru and Ecuador, westward into the Pacific area.

Genus **Mabuya**

FITZINGER, Neue Classif. Reptil., 1826, p. 23
(type species, *carinata*)

Mabuya agilis[1] (RADDI)

Scincus agilis RADDI, Mem. matem. e fisic. Soc. Ital. Modena, Vol. 19, No. 18, 1823, p. 62 (type locality, Brazil).

Mabuia agilis BOULENGER, Cat. Liz. British Mus., Vol. 3, 1887, p. 190.

RANGE: South America, except southern part.

Mabuya dorsovittata[2] COPE

Mabuia dorsovittata COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 350 (type locality, Paraguay).

RANGE: Paraguay, Uruguay, Brazil, and Argentina.

Mabuya frenata (COPE)

Emoea frenata COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 187 (type locality, Paraguay River Valley, Paraguay).

Mabuia frenata BOULENGER, Cat. Liz. British Mus., Vol. 3, 1887, p. 194.

RANGE: Paraguay, Uruguay, Brazil and Argentina.

Mabuya nigropalmata ANDERSSON

Mabuia nigropalmata ANDERSSON, Arkiv. f. Zool. Vol. 11, No. 16, 1918, p. 8 (type locality, Rio Curuca, tributary of the Rio Javary, Amazon Basin, Brazil, and San Fermin, northwestern Bolivia).

RANGE: Venezuela, Brazil, Bolivia and Peru.

Mabuya punctata (GRAY)

Tiliqua punctata GRAY, Ann. Nat. Hist., Vol. 2, 1838, p. 289 (type locality, Fernando do Noronha, Brazil).

Mabuia punctata BOULENGER, Cat. Liz. British Mus., Vol. 3, 1887, p. 169.

RANGE: Island of Fernando do Noronha, Brazil.

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[1] This name (*M. agilis*) is used here in place of *M. aurata* (Schneider, 1801) which is preoccupied by *M. aurata* (Linnaeus, 1758). We have found Schneider's species to be identical with the *agilis* of Raddi, which, although described at a later date, now becomes applicable to the form concerned.

[2] We believe that *Scincus nigropunctatus* Spix, Spec. Novae Lacert. Bras., 1825. p. 24 (type locality, Ecga, Brazil), is not distinct from this form. If future research supports this conclusion, the present species must be recognized under the prior name—*Mabuya nigropunctata* (Spix).

abendrothii, Chalcides (Hapalolepis), 70.
abendrothii, Ophiognomon, 70.
Ablepharus poecilopleurus, 85.
abrupteseriatus, Phyllodactylus, 6.
aculeatus, Leiocephalus, 27.
aculeatus, Leiocephalus iridescens 27.
acutirostris, Ecpleopus (Euspondylus), 61.
acutirostris, Euspondylus, 61-62.
acutirostris, Polychrus, 41.
acutirostris, Polychrus marmoratus, 41.
adspersus, Ctenoblepharys, 23.
aeneus, Anolis, 12.
aequatorialis, Anolis, 12.
affine, Lepidosternon, 82.
affine, Leposternon, 82.
affinis, Ecpleopus, 61.
affinis, Ecpleopus (Aspidolaemus), 61.
Agama catenata, 25.
cristata, 23.
hispida, 48.
semitaeniata, 47.
agassizi, Anolis, 12.
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agilis, Mabuya, 86.
agilis, Scincus, 86.
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barringtonensis, Tropidurus, 45.
albemarlensis, Tropidurus, 44.
albemarlensis, Tropidurus albemarlensis, 44-45.
albi, Anolis, 13.
albocingulata, Amphisbaena, 78.
albogularis, Gonatodes, 1.
albogularis, Gymnodactylus, 1.
albostrigatus, Prionodactylus, 64.
alleni, Scolecosaurus, 76.
alligator, Anolis, 12.
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altamazonicus, Kentropyx, 66.
alticolor, Liolaemus, 30.
altissimus altissimus, Liolaemus, 30.
araucaniensis, Liolaemus, 30.
Liolaemus altissimus, 30.
amarali, Gymnodactylus, 3.
amazonicus, Crocodilurus, 60.
amazonicus, Sphaerodactylus, 10.
amazonius, Alopoglossus, 70.
amazonius, Pantodactylus, 70.
Amblyrhynchus, 11.
cristatus, 11.
subcristatus, 22.
ameiva, Ameiva, 51.
laeta, Ameiva, 51.
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An Aurora Observed in Missouri and Its Connection with Solar Activity

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AN AURORA OBSERVED IN MISSOURI AND ITS CONNECTION WITH SOLAR ACTIVITY.

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Brilliant auroral displays are very rarely seen as far south as Missouri, but the year 1932 was an exception to this rule, for two were seen in the neighborhood of St. Louis in the late spring of that year. One, lasting for more than twenty-four hours, was widely observed on the nights of May 29th and 30th; the second was seen on June 20th. The following descriptions of these two auroras are based on the reports of observers in several localities near St. Louis, Missouri, and one in Wisconsin. They are of unusual importance, not only because of the rarity of such brilliant displays in this latitude, but also because of their probable connection with activity observed on the sun at about the same time.

Observations at Allenton, Missouri.

The aurora of May 29th and 30th was observed by the writer on the night of May 29th, at Allenton, Missouri (longitude, 90° 40′.2 W.; latitude, 38° 29′.5 N.). It was watched all night, and the following description gives its appearance at various times and the sequence of the changes that occurred.

7:30 P. M. (Central Standard Time). An arch of light spanning the northern sky was seen, its lower boundary very sharply defined, and its upper side fading out gradually into the sky, which was not yet dark. The arc of the horizon embraced by the arch of light was found by measurement to be 102°, more than a quarter of the whole circle of the horizon. (Fig. 1).

9:18 P. M. The arch began to brighten and within the next few minutes, six rays darted downward to the horizon, crossing the dark area beneath it. (Fig. 2). Each ray faded out within half a minute of its first appearance. Seven or eight others darted downward as the first ones had done, but from near the ends of the arch.

9:40 P. M. The arch had widened and brightened further. Several faint rays from 5° to 8° in length darted upward. (Fig. 3).

10:15 P. M. The dark area below the arch began to glow and soon became fully as bright as the arch itself. The color of the arch changed from pearly-white to a very dilute green. Rays varying from ½° to 8° in width appeared in greater numbers, each one fading out but immediately replaced by another. The narrow ones were generally the brightest and longest; sometimes they reached a length of 15° to 20°. Near the western extremity of the arch a bright streamer 15° wide appeared at 10:20 p. m., its west-

ern edge defined sharply but its eastern edge very indistinct; it remained visible for about one hour and twenty-five minutes. (Fig. 4.)

10:35 P. M. The most active period of the display began, when a very sudden increase in brightness set in. Great streamers of white light appeared, many of which were over forty degrees in length, some narrow and some wide. At first the activity centered in the west, then in the east, followed by even greater activity at the middle of the arch, and finally the rays blazed forth all along the arch. The greatest activity and brilliance came at 10:38 p. m., and for some minutes thereafter, when the whole area of the display, even between the rays, glowed with a soft pearly light. (Fig. 5). No single observer could possibly see everything that was taking place; the events came in such rapid succession that observation was like watching a three-ring circus. Only two parts of the whole phenomenon remained constant during this period; these were the arch itself and the bright ray at its western end. Many rays, particularly the brightest ones, darted upward very rapidly. Many of these would, after darting upward, pause for a moment and then move laterally, always toward the west. One narrow ray, probably the brightest of them all, darted upward just east of the meridian, all the way to a point 15° above Polaris and about 53° above the horizon. It lasted fully five minutes. Another ray darted from the western end of the arch at the horizon to *40 Lyncis* and 6° or 8° beyond into Leo Minor. It made an angle of 50° with the horizon. A wide, faint ray arose just west of the meridian, and it terminated in an irregular, diagonal line running through Polaris and making an angle of 30° with the meridian. The upper extremity of this ray reached a point 3° west of *Beta Ursae Minoris*. Several long rays appeared along the eastern end of the arch, one of which crossed Lacerta and Cygnus to a point 3° west of Deneb. Most of the rays were now exhibiting colors; those near the ends of the arch were pale rosy-pink, and those near the center dilute green like the arch. A few were still white. The colors in many instances would come and go in cycles of a few seconds' duration. Many of the shorter rays were moving rapidly toward the west. At one time there were no less than ten long rays that looked like great searchlight beams.

11:30 P. M. The rays became less conspicuous and most of the activity ceased. The dark area below the arch reappeared and the whole aurora looked much as it did before 10:15 p. m.

11:40 P. M. The area above the arch began to brighten and was soon as bright as the arch. Then it broke into a number of cloud-like parts, which were roughly oval in shape, but had some-

what irregular outlines. They bore a marked resemblance to the star clouds of Sagittarius and Scutum, although they were much brighter. Soon the brightness of these clouds began to vary in regular periods of about 4 seconds. When bright they were pink, and when faint they were greenish like the arch.

11:47 P. M. For about eight minutes, long dark waves, parallel with the horizon, started from the upper edge of the arch and crossed upward and over the cloud-like areas, at a rate of about 10° per second. These areas had the appearance of fields of grain being blown by the wind. (Fig. 6). The waves had no relation to the variation in brightness and color, which continued until 11:55 p. m., when they all stopped, leaving only faint remnants of the cloudy areas.

11:55 P. M. Rays continued to come and go, although they were becoming shorter and fainter.

12:00 Midnight. Little change was going on, and only an occasional colorless ray was seen.

1:05 to 4:25 A. M. No more rays were observed and nothing was left but the arch, which remained as bright as ever until dawn. It was gradually overpowered by the light of dawn, and was last observed at 4:25 a. m., just a few minutes before sunrise.

The great brilliance of this display is shown by the fact that its light was sufficient to light up the surrounding hilltops and to cause objects to cast very black shadows, which, due to the wide expanse of the arch, had very indistinct edges. As far as could be determined, the landscape was about as intensely lighted as by a four-day moon. However bright the arch and rays became, they did not prevent the light of fourth magnitude stars from passing through. Apparently, the effect of the aurora on the brilliance of the stars was similar to that of the moon; it lighted up the whole sky with scattered light that blotted out the fainter stars.

This aurora was similar in many respects to one seen in Paris, France, on October 24, 1870, figured by Angot (1897, pp. 22 to 37), who would classify it in his "arc with rays" type. The night of May 29, 1932, was unusually clear, and all colors observed were very weak, which is in accord with Angot, who states that in general, less coloring is observed on very clear nights than on partly cloudy or foggy nights.

Observations at Madison, Wisconsin, May 29th.

Simultaneously with the observations at Allenton, Mrs. Phil Rau, of Kirkwood, Missouri, observed the same aurora from Madison, Wisconsin, about 320 miles north of Allenton. Early in the eve-

ning she saw a faint arch of light extending across the northern sky, cutting the horizon at two points a little less than 180° apart. After 10:30 p. m., the display became much brighter, and indistinct shafts of light, apparently radiating from a point below the horizon, appeared through waves of light that moved like ripples and looked like smoke lighted from below and coming from the north. At this time there was no definite arch. Weak colors were exhibited, principally rosy-pink.

Observations in Washington and Jefferson Counties, Missouri.

Miss Dorothy Boyer, of Kimmswick, Missouri, observed a wide ribbon of light extending obliquely from the west toward Polaris, at about midnight on the night of May 30, 1932, while motoring from Washington County, Missouri, into Jefferson County. A little after 1:45 a. m., the northern border of the ribbon became edged with pink, and sulphur-colored lights alternating with salmon-pink shafts appeared. These faded out shortly, leaving the sky glowing in a lively manner, but colorless. This display was probably the end of the aurora that began the day before, and is therefore further evidence of its magnitude.

Observations at Valley Park, Missouri, on June 20, 1932.

Miss Nellie Matlock and party, of St. Louis, Missouri, observed an aurora on the night of June 20, 1932, near Valley Park, Missouri. This display was described as being comparable to the moon in brilliance. A number of rays were seen, although no mention was made of an arch in the north. The display was iridescent, with a slight predominance of bluish-lavender and red. According to Angot (loc. cit., p. 36), bluish-lavender is rather rare in auroras.

Discussion.

The causes of auroral activity are not yet entirely understood, although it has been well established that sun-spots, terrestrial magnetism, and auroras are related phenomena. The records of sun-spot numbers, magnetic disturbances on the earth, and auroral activity have shown that when sun-spots are numerous, the frequency and intensity of both auroras and magnetic storms are greater, and that great auroras are always accompanied by magnetic storms.

Birkeland (1913) projected cathode rays into the field of a magnetized iron ball placed in a glass box in which the air was under very low pressure, and by varying the strength of the magnetic field of the ball, the intensity of the cathode rays, and the pressure, he was able to reproduce certain features of the aurora and other phe-

nomena. Here we may have an experimental approach to the true nature of auroras. At least it seems to bear out the theory of Störmer,* which states that electrically charged particles shot off at great velocities by eruptions on the sun reach the earth's magnetic field, which deflects them toward the magnetic poles. When they come into the upper portion of the atmosphere near the poles, they set up visible electrical discharges that we see as an aurora.

A number of instances of observed solar activity followed by magnetic storms and auroral displays have been recorded. Hale (1931, pp. 71 to 76) cites several such cases, one of which occurred on January 26, 1926, when Störmer observed a brilliant aurora near Oslo, Norway. Hale observed an eruption near a great sun-spot on January 24th, and on the 25th he observed a second and very remarkable eruption near the same spot. Magnetic disturbances of great magnitude were observed at Greenwich and elsewhere simultaneously with this aurora, and on the 27th as well.

Upon observing the solar disc in the afternoon of May 22, 1932, the writer found one large spot in the southern hemisphere near the equator, and not far from the east limb. Three smaller spots were found in the same latitude, near the west limb, and they disappeared around the limb within the next few days. On May 24th, two days later, the large spot had been carried nearer to the central meridian by the rotation of the sun. Three small spots not present on the 22nd were visible south of the large spot, but very near it. By 6:00 p. m., May 27th, the large spot had passed the central meridian and the three small spots had completely disappeared. The appearance of these spots on the 24th and their disappearance before the 27th, is evidence that there was considerable activity in their vicinity. The large spot was still visible on May 30th.

Dr. G. E. Hale, of the Mount Wilson Observatory, has informed the writer, in a letter, that he received word from Dr. Nicholson, in charge of solar work at Mount Wilson, that only one magnetic storm occurred during May; this was on May 29th and 30th. On May 29th there was no exceptional activity observed around the only spot visible at that time, but on May 28th there was increased activity in a bright hydrogen area near the spot. Dr. Hale further explained that an eruption adequate to account for the aurora could easily have been missed, as only a few photographs of the sun were taken at Mount Wilson each morning.

Unfortunately, the writer had not observed the sun during June and therefore cannot present any evidence of solar activity preced-

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* Described briefly by Kennelly, 1932.

ing the aurora of June 20th, although a spot was observed near the west limb on July 7th. It could hardly have been responsible for the second aurora because it passed the central meridian after the aurora, whereas, to have caused it, the spot should have passed the central meridian shortly before the aurora. The display of June 20th did come, however, 21 days after the ending of the aurora of May 29th and 30th, which time is just a little less than the period of the sun's rotation. The area of disturbance observed before May 29th would again have been near the central meridian about June 20th. Therefore, the same area may have been responsible for both auroras.

Conclusions.

Although the observed solar activity was not pronounced, the coincidence in time between the auroral display of May 29th and 30th, 1932, and the hydrogen activity near a sun-spot observed just before the display, justify our conclusions that a real relation existed between the two. This seems more probable because of the appearance of a second aurora after an interval of time nearly equal to the period of the sun's rotation. In the foregoing observations, therefore, we have an instance in which a particular atmospheric and magnetic disturbance on the earth was preceded by a definite solar disturbance. This is further evidence of the direct relationship between solar and terrestrial phenomena, and of the influence that cosmic disturbances have upon the earth.

Literature Cited.

Angot, Alfred. The Aurora Borealis. New York, 1897.

Birkeland, Kr. On the Cause of Magnetic Storms and the Origin of Terrestrial Magnetism (The Norwegian Aurora Polaris Expedition, 1902-1903, Vol. I, Part II), transl. by Miss Jessie Muir. Christiania, Norway, 1913.

Hale, G. E. Signals from the Stars. New York, 1931.

Kennelly, A. E. Cosmic Disturbances of the Earth's Magnetic Field and their Influence upon Radio Communication. Scientific Monthly, XXXV, No. 1: 42-56. July, 1932.

EXPLANATION OF PLATES.

Fig. 1. The aurora when first seen at 7:30 p. m., showing the arch which contrasts sharply with the very dark area below. The hilltops can be seen still illuminated by the twilight.

Fig. 2. Between 9:18 and 9:40 p. m. The sky is now darker and the arch brighter; six rays are shown extending from the arch to the horizon.

Fig. 3. 9:40 p. m. The first few rays that appeared are shown extending upward from the widened arch.

Fig. 4. 10:15 p. m. The dark area beneath the arch has become as bright as the arch and merged with it. More rays are shown, including the great ray near the western end of the arch.

Fig. 5. 10:38 p. m. The display at the time of maximum activity. Many of the great rays are seen, but it is entirely impossible for a drawing to give an adequate impression of the rapid movement produced by the darting and playing of the rays.

Fig. 6. 11:47 p. m. The dark segment beneath the arch has reappeared. Many small cloud-like areas are shown, while the dark waves parallel with the horizon are moving upward across them. The upper extremities of a few rays can be seen above the clouds.

NOTE—The principal features of the aurora were sketched on the morning after observation, from notes made during its progress. The drawings for the plates were made from these sketches afterward.

Figure 1.

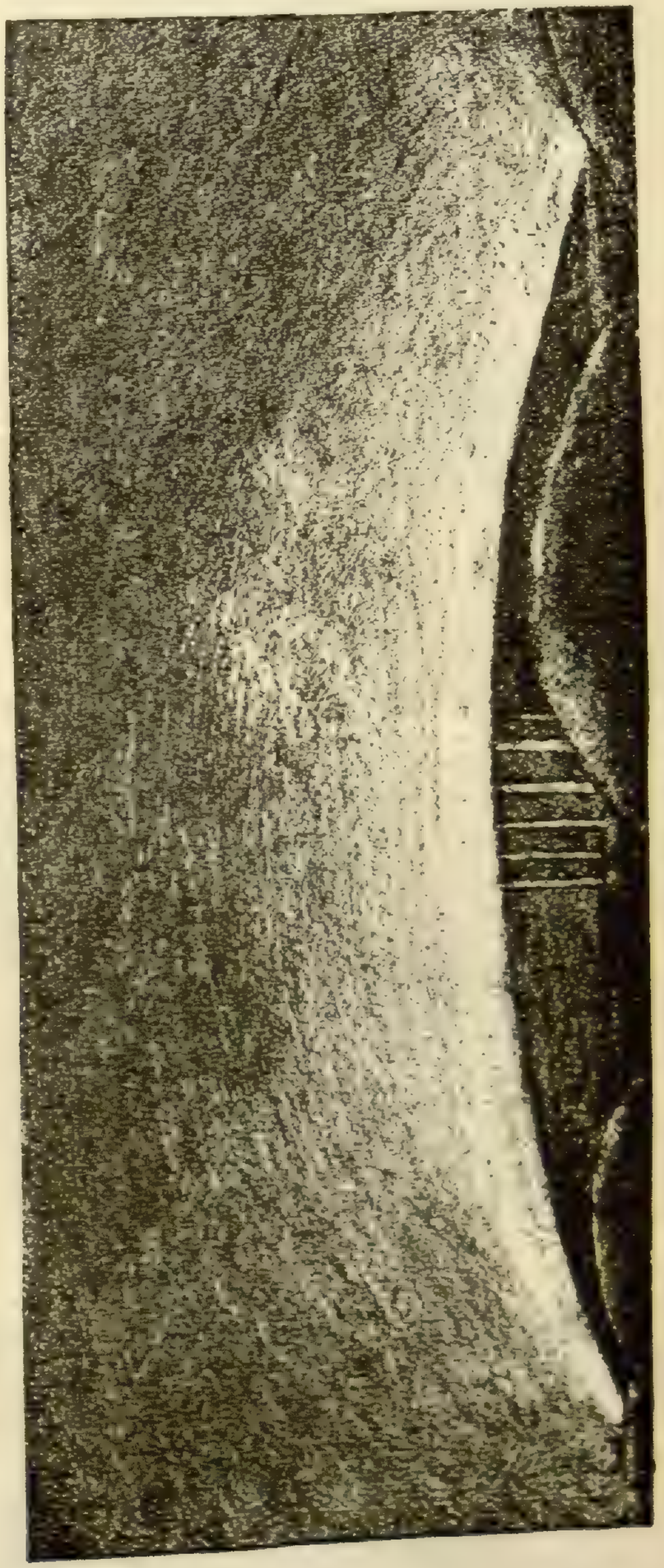

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

Transactions of the Academy of Science
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VOLUME XXVIII, Nos. 3 and 4

Bibliographic Index of North American Species of the Eublastoidea

DARLING K. GREGER

An Annotated List of the Amphibians and Reptiles of Jefferson County, Mo.

DOROTHY A. BOYER
and
ALBERT A. HEINZE

Issued April 1, 1934

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Issued April 1, 1934

Bibliographic Index of North American Species *of the* Eublastoidea

by

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INTRODUCTION

This work is essentially an index and reference list to the literature on the Eublastoidea; with it the compiler had in view the idea of making it possible for the user, either in the field or laboratory, to find a ready reference to the literature covering every species described from North American formations.

The literature dealing with North American species of the Eublastoidea is scattered through a great number of State and Federal publications, Journals and Transactions of learned societies, extending back over a period of more than one hundred years. (1825-1932.)

Many of the species published by the earlier writers have never been properly illustrated and many will doubtless prove to be synonyms and will be eliminated in a synopsis of the group, upon which the writer is now engaged.

With the exception of Owen's "Catalogue of Geological Specimens from the Ohio Valley, 1843," every reference recorded in the index has been read by the compiler, and the plan has been to follow, as far as practicable, that used in dealing with other groups of fossils.

The compiler is greatly indebted to the officials of Ridgely Library, Washington University, for their assistance in procuring the loan of numerous rare papers. Also he is equally indebted to the Rockefeller Foundation to Washington University for scientific research, for a grant to cover the expense of preparation of the paper.

Register of Generic Names Under Which North American Species of Blastoids Have Been Described

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Ambolostoma Peck, 1920.
Pan-American Geologist, vol. 54, p. 104.

Carpenteroblastus Rowley, 1901.
American Geologist, vol. 27, June, 1901, p. 347.

Cidaroblastus, Hambach, 1903.
Transactions, St. Louis Academy of Science, vol. 13, p. 45.

Clavaeblastus, Hambach, 1903.
Transactions, St. Louis Academy of Science, vol. 13, pp. 44-45.

Codaster, McCoy, 1849.
Annals and Magazine of Natural History, Series 2, vol. 3, p. 250.

Condonites, Meek and Worthen, 1869.
Proceedings, Philadelphia Academy of Natural Sciences, p. 84.

Cribroblastus, Hambach, 1903.
Transactions, St. Louis Academy of Science, vol. 13, pp. 39-42.

Cryptoblastus, Etheridge and Carpenter, 1886.
Catalogue of the Blastoidea, British Museum, p. 229.

Eleutheroblastus Hambach, 1903.
Transactions, St. Louis Academy of Science, vol. 13, p. 35.

Elaeacrinus, Roemer, 1851.
Archiv. f. Naturgesch. Jahrg. XVII, Bd. 1, p. 375.

Eleutherocrinus Shumard and Yandell, 1856.
Proceedings, Philadelphia Academy of Natural Sciences, vol. 8, p. 73.

Globoblastus Hambach, 1903.
Transactions, St. Louis Academy of Science, vol. 13, p. 46.

Granatocrinus Troost, 1850.
American Journal of Science, vol. 8, p. 420.

Heteroschisma Wachsmuth, 1883.
Illinois Geological Survey, vol. 7, p. 352.

Lophoblastus Rowley, 1901.
American Geologist, vol. 27, June, 1901, p. 344.

Mesoblastus ETHERIDGE and CARPENTER, 1886.
Catalogue of the Blastoidea, British Museum, p. 181.

Metablastus ETHERIDGE and CARPENTER, 1886.
Catalogue of the Blastoidea, British Museum, p. 196.

Nucleocrinus CONRAD, 1842.
Journal, Philadelphia Academy of Natural Sciences, vol. 8, p. 280.

Olivanites TROOST, 1849.
American Journal of Science, vol. 8, p. 419.

Orbitremites GRAY, 1840.
Synop. Contents of the British Museum, 42nd Edition, p. 63.

Orophocrinus VON SEEBACH, 1864.
Nachs. Kgl. Gesellsch. Wissensch. zu Göttingen, p. 110.

Pentremites SAY, 1820.
American Journal of Science, vol. 2, p. 36.

Pentremitidea D'ORBIGNY, 1849.
Prodromus de Paleontologie, vol. 1, p. 102.

Saccoblastus HAMBACH, 1903.
Transactions, St. Louis Academy of Science, vol. 13, pp. 42-44.

Schizoblastus ETHERIDGE and CARPENTER, 1882.
Annals and Magazine of Natural History, vol. 9, p. 243.

Tricoelocrinus MEEK and WORTHEN, 1868.
Proceedings, Philadelphia Academy of Natural Sciences, p. 356.

Troostocrinus SHUMARD, 1865.
Transactions, St. Louis Academy of Science, vol. 2, p. 384.

CATALOGUE OF SPECIES

AMBOLOSTOMA

Ambolostoma baileyi PECK.

1930, Pan-American Geologist, vol. 54, p. 104, pl. 14. figs. 9-13.
Brazer limestone; Mendon, Utah.

CARPENTEROBLASTUS

Carpenteroblastus pentagonus ROWLEY.

1901, American Geologist, vol. 27, p. 347, pl. 28, figs. 26-27.
Lower Burlington limestone; Louisiana, Missouri.

Carpenteroblastus veryi ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 127, pl. 36, figs. 46-48.
Keokuk; Burksville, Cumberland County, Kentucky.

CIDAROBLASTUS

Cidaroblastus granulatus (ROEMER), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 45, pl. 3, figs. 1-3.

Cidaroblastus parvus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 58, pl. 5, fig. 1.
St. Louis limestone; Southwestern Missouri.

CLAVAEBLASTUS

Clavaeblastus americana (BARRIS), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 44.

Clavaeblastus filosa (WHITEAVES), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 44.

Clavaeblastus milwaukensis (WELLER), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 44.

Clavaeblastus reinwardti (TROOST), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 44.

CODASTER

Codaster alternatus LYON.

1857, Kentucky Geological Survey, Third Report, p. 493, pl. 5, fig. 3 a-b.
Devonian; Beargrass Creek, Jefferson County, Kentucky.

Codaster americanus SHUMARD.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 239.
(Not figured.)
Devonian; Falls of the Ohio River.

Codaster americanus SHUMARD, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster attenuatus LYON, ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 10, 1902, pp. 94-95, pt. 30, figs. 14-15, 20-21.
Middle Devonian; Falls of the Ohio River.

Codaster attenuatus LYON, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster attenuatus LYON, ROWLEY.

1903, Indiana Contributions to Paleontology, vol. 1, pt. 12, 1903, p. 128, pl. 36, figs. 50-51.
Middle Devonian; Columbus, Ohio.

Codaster attenuatus var. robustus ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 10, 1902, p. 94, pl. 30, figs. 12-13, 16-17.
Upper Devonian; Cement Quarry, Clark County, Indiana.

Codaster blairi MILLER and GURLEY.

1895, Illinois State Museum of Natural History, Bulletin No. 7, Springfield, pp. 86-87, pl. 5, figs. 20-22.
Chouteau limestone; Sedalia, Missouri.

Codaster canadensis BILLINGS.

1869, American Journal of Science and Arts, Series 2, vol. 48, p. 79.
Hamilton Group; Bosanquet Township, Ontario.

Codaster canadensis BILLINGS.

1870, Annals and Magazine of Natural History, Series 4, vol. 5, pp. 262-263.
Hamilton Group; Bosanquet Township, Ontario.

Codaster canadensis BILLINGS.

1874, Canadian Geological Survey, Paleozoic Fossils, vol. 2, pp. 100-101.
Hamilton Group; Bosanquet Township, Ontario.

Codaster canadensis BILLINGS, WHITEAVES.

1889, Canadian Contributions to Paleontology, vol. 1, pt. 2, p. 109, pl. 14, figs. 4-4a.
Hamilton Group; vicinity of Thedford, Ontario.

Codaster canadensis BILLINGS, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster gracillimus ROWLEY and HARE.

1891, The Kansas City Scientist, vol. 5, p. 99, pl. 2, figs. 6, 7.
Lower Burlington limestone; Louisiana, Missouri.

Codaster gracillimus ROWLEY and HARE, ROWLEY.

1900, American Geologist, vol. 25, 1900, p. 66, pl. 2, figs. 6-8.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Codaster gracillimus ROWLEY and HARE, ROWLEY.

1905, American Geologist, vol. 35, 1905, p. 307, pl. 21, figs. 31-32.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Codaster gracilis (WACHSMUTH), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster gracilis (WACHSMUTH), THOMAS.

1920, Iowa Geological Survey, vol. 29, 1920, pl. 36, figs. 13-14.
Hamilton Group; Alpena, Michigan.

Codaster grandis ROWLEY and HARE.

1891, The Kansas City Scientist, vol. 5, p. 99, pl. 2, fig. 8.
Upper Burlington, Louisiana, Missouri.

Codaster grandis ROWLEY and HARE, ROWLEY.

1900, American Geologist, vol. 25, 1900, p. 66, pl. 2, figs. 9-11.
Upper Burlington limestone; Louisiana, Pike County, Missouri.

Codaster grandis ROWLEY and HARE, ROWLEY.

1905, American Geologist, vol. 35, 1905, p. 309, pl. 21, figs. 40-41.
Upper Burlington limestone; Louisiana and Curryville, Missouri.

Codaster gratiosus MILLER.

1880, Cincinnati Society of Natural History, Journal, vol. 2, p. 257, pl. 15, figs. 5-5a.
Keokuk Group; New Bloomfield, Missouri.

Codaster hindei SLOCUM.

1906, Field Columbian Museum, Chicago, Geological Series, vol. 2, No. 8, p. 263.
Hamilton Group; Western New York.

Codaster jessieae MILLER and GURLEY.

1896, Illinois State Museum of Natural History, Springfield, Bulletin No. 10, pp. 89-90, pl. 5, figs. 20-22.

Chouteau limestone; Sedalia, Missouri.

Codaster kentuckyensis (SHUMARD), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster (Cryptoschisma) laeviculus ROWLEY.

1900, American geologist, vol. 25, 1900, p. 65, pl. 2, figs. 1-5.

Upper Burlington limestone; Louisiana, Pike County, Missouri.

Codaster (Cryptoschisma) laeviculus ROWLEY.

1900, American Geologist, vol. 25, 1900, p. 271, pl. 5, fig. 74.

Upper Burlington limestone; Louisiana, Pike County, Missouri.

Codaster laeviculus ROWLEY.

1905, American Geologist, vol. 35, 1905, p. 309, pl. 21, figs. 37-39.

Upper Burlington limestone; Louisiana, Pike County, Missouri.

Codaster lorae DUNBAR.

1920, Transactions, Connecticut Academy of Arts and Sciences, vol. 23, pp. 119-120, pl. 2, figs. 1-2.

Lower Devonian, Birdsong Formation; Birdsong Creek and 2½ miles northeast of Parsons, Tennessee.

Codaster pulchellus (MILLER and DYER), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster pyramidatus SHUMARD.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 238, pl. 9. figs. 1 a-e.

Devonian; Falls of Ohio River, Beargrass Creek, near Louisville, Kentucky and Columbus, Ohio.

Codaster pyramidatus SHUMARD, HALL.

1862, New York State Cabinet of Natural History, 15th Report, p. 152, pl. 1, figs. 12-13.

Upper Helderberg limestone; Caledonia, Livingston County, New York.

Codaster pyramidatus SHUMARD, ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 10, 1902, p. 95, pl. 30, figs. 18-19, 22-23- 24-25.

Middle Devonian; Columbus, Ohio.

Codaster pyramidatus SHUMARD, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster stelliformis SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 359.

Codaster subtruncatus (HALL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 48.

Codaster subtruncatus (HALL), THOMAS.

1920, Iowa Geological Survey, vol. 29, pp. 422-423, pl. 36, fig. 15.
Cedar Valley limestone; Buffalo, Iowa.

Codaster superbus ROWLEY.

1905, American Geologist, vol. 35, 1905, p. 308, pl. 21, figs. 35-36.
Upper Burlington limestone; Louisiana, Pike County, Missouri.

Codaster whitei HALL.

1861, Boston Society of Natural History, Journal, vol. 7, p. 327.
Burlington limestone; Burlington, Iowa.

Codaster whitei HALL.

1861, Descriptions of New Species of Crinoids, p. 10.
Burlington limestone; Iowa.

Codaster sp? ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 10, pp. 95-96, pl. 30, figs. 26-27.
Upper Devonian; Charlestown, Indiana.

CODONITES

Codonites campanulatus HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, 1886, pp. 553-554, pl. D, figs. 8-9.
Burlington limestone; Sedalia, Missouri.

Codonites campanulatus HAMBACH, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 47.

Codonites conicus (WACHSMUTH and SPRINGER), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 47.

Codonites fusiformis (WACHSMUTH and SPRINGER), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 47.

Codonites gracilis MEEK and WORTHEN.

1870, Proceedings, Philadelphia Academy of Natural Science, p. 32.
Lower Burlington limestone; Burlington, Iowa.

Codonites gracilis MEEK and WORTHEN.

1873, Illinois Geological Survey, vol. 5, p. 467, pl. 8, fig. 6.
Burlington limestone, Burlington, Iowa.

Codonites gracilis MEEK and WORTHEN, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 47.

Codonites inopinatus ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, p. 100, pl. 2, figs. 11, 12, p. 118, pl. 3, fig. 17.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Codonites? inopinatus ROWLEY.

1900, American Geologist, vol. 25, 1900, p. 67, pl. 2, fig. 18.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Codonites? inoptinatus? ROWLEY.

1900, American Geologist, vol. 25, p. 67, pl. 2, fig. 19.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Codonites stelliformis MEEK and WORTHEN.

1869, Proceedings, Philadelphia Academy of Natural Science, p. 84 (note).

Codonites stelliformis (OWEN and SHUMARD), BILLINGS.

1870, American Journal of Science, vol. 50, p. 232, figs. 10, 11.

Codonites stelliformis OWEN and SHUMARD, MEEK and WORTHEN.

1873, Illinois Geological Survey, vol. 5, p. 464, pl. 9, fig. 5.
Burlington limestone; Burlington, Iowa.

Codonites stelliformis MEEK.

1874, American Journal of Science, Series 3, vol. 7, p. 374.
Burlington limestone; Burlington, Iowa.

Codonites stelliformis (OWEN and SHUMARD), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 47.

Codonites stelliformis (OWEN and SHUMARD), ROWLEY.

1908, Geology of Missouri, vol. 8, 2nd Series, 1908, p. 97, pl. 20, figs. 1-11.
Burlington limestone; Louisiana, Pike County, Missouri.

Codonites stelliformis cotactus ROWLEY.

1909, Geology of Missouri, vol. 8, 2nd Series, 1909, pp. 97-98, pl. 20, fig. 12.
Lower Burlington; Louisiana, Missouri.

Codonites whitei (HALL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 47.

CRIBROBLASTUS

Cribroblastus cornutus (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 40.

Cribroblastus curtus (SHUMARD), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 40.

Cribroblastus granulosus (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 40, pl. 5, fig. 12.

Cribroblastus incisus HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 57, pl. 5, fig. 2.
Lower Burlington limestone; Burlington, Iowa.

Cribroblastus kirkwoodensis (SHUMARD), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 40.

Cribroblastus lotoblastus (WHITE), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 40.

Cribroblastus melo (OWEN and SHUMARD), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 40.

Cribroblastus melonoides (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41.

Cribroblastus neglectus (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41, pl. 5, fig. 11.

Cribroblastus pisum (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41, pl. 5, fig. 13.

Cribroblastus potteri (HAMBACH), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41, pl. 5, fig. 15.

Cribroblastus projectus (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41.

Cribroblastus roemeri (SHUMARD), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41, pl. 5, fig. 10.

Cribroblastus sampsoni (HAMBACH), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 41, pl. 5, fig. 9.

Cribroblastus sayi (SHUMARD), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 42, pl. 5, fig. 14.

Cribroblastus schucherti HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, pp. 59-60, p. 5, figs. 8-8a.

Subcarboniferous; Divide between Ross Fork and Lincoln Valley, Montana.

Cribroblastus shumardi (MEEK and WORTHEN), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 42.

Cribroblastus tenuis HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 63, pl. 5, figs. 17-17a.

Chouteau limestone; Pettis County, Missouri.

Cribroblastus tenuistriatus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 59, pl. 5, fig. 16.

Burlington limestone; Cooper County, Missouri.

Cribroblastus verrucosus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, pp. 58-59, pl. 5, fig. 3.

Burlington limestone; Allenton, St. Louis County, Missouri.

CRYPTOBLASTUS

Cryptoblastus kirkwoodensis (SHUMARD), KEYES.

1894, Missouri Geological Survey, Pal. vol. 4, p. 139, pl. 18, figs. 8 a-b.

St. Louis limestone; Kirkwood, St. Louis County, Missouri.

Cryptoblastus melo O. and S., KEYES.

1894, Missouri Geological Survey, vol. 4, p. 139, pl. 18, figs. 7 a-b.

Lower Burlington limestone; Sedalia, Louisiana and Hannibal, Mo.

Cryptoblastus melo (O. and S.), ROWLEY.

1905, American Geologist, vol. 35, 1905, p. 301, p. 21, figs. 2, 3.
Lower Burlington limestone, Louisiana, Pike County, Missouri.

Cryptoblastus melo (O. and S.), VAN TUYL.

1922, Iowa Geological Survey, vol. 30, pl. 4, figs. 5-6.
Burlington limestone; Burlington, Iowa.

ELAEACRINUS

Elaeacrinus angularis, SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 368.

Upper Helderberg; Beargrass Creek, Louisville, Kentucky, Falls of Ohio River.

Elaeacrinus kirkwoodensis SHUMARD.

1863, Transactions, St. Louis Academy of Science, vol. 2, p. 113.

St. Louis limestone; near Kirkwood, Missouri.

Elaeacrinus melo SHUMARD.

1863, Transactions, St. Louis Academy of Science, vol. 2, No. 1, p. 112.

Elaeacrinus meloniformis BARRIS.

1886, Proceedings, Davenport Academy of Natural Science, vol. 4, pp. 91-93, pl. 1, fig. 3.

Hamilton Group; Buffalo, Iowa, Thunder Bay, Michigan.

Elaeacrinus norwoodi SHUMARD.

1863, Transactions, St. Louis Academy of Science, vol. 2, No. 1, p. 112.

Encrinital limestone.

Elaeacrinus obovatus BARRIS.

1886, Proceedings, Davenport Academy of Natural Science, vol. 4, pp. 88-91, pl. 1, figs. 1-2.

Hamilton Group; Buffalo, Iowa City, Iowa, Thunder Bay, Michigan.

Elaeacrinus verneuili SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 369.

Upper Helderberg; Falls of Ohio, Columbus, Ohio.

ELEUTHEROBLASTUS

Eleutheroblastus cassedayi (SHUMARD and YANDELL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 51.

Eleutheroblastus whitfieldi (HALL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 51.

ELEUTHEROCRINUS

Eleutherocrinus cassedayi SHUMARD and YANDELL.

1856, Proceedings, Academy of Natural Sciences, Philadelphia, vol. 8, p. 73, pl. 2.
Upper Helderberg Group; Falls of the Ohio.

Eleutherocrinus cassedayi S. and Y., WHITEAVES.

1889, Canadian Contributions to Paleontology, vol. 1, No. 2, p. 110, pl. 14, figs. 5 a-b.
Hamilton Group; Thedford, Ontario.

Eleutherocrinus cassedayi (S. and Y.), ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, No. 10, p. 91, pl. 30, figs. 1-4.
Upper Devonian; Charlestown, Indiana.

Eleutherocrinus cassedayi Y. and S., ROWLEY.

1903, Indiana Contributions to Paleontology, vol. 1, pt. 16, 1903, p. 161, pl. 47, figs. 17-20.
Upper Devonian; Charlestown, Indiana.

Eleutherocrinus cassedayi KIRK.

1911, Proceedings, U. S. National Museum, vol. 41, No. 1846, p. 137, pl. 10, figs. 6, 7, 8.
Hamilton; Ontario.

Eleutherocrinus whitfieldi HALL.

1862, New York State Cabinet of Natural History, 15th Report, pp. 151-152.
Hamilton Group; Western New York.

GLOBOBLASTUS

Globoblastus magnificus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 61, pl. 3, fig. 5.
Burlington limestone; Southwestern Missouri.

Globoblastus norwoodi (OWEN and SHUMARD), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 46.

Globoblastus ornatus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 62, pl. 5, fig. 4.
Burlington limestone; Missouri.

Globoblastus spathatus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 62, pl. 5, fig. 5.

Burlington limestone; Allenton, St. Louis County, Missouri.

GRANATOCRINUS

Granatocrinus aplatus ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, p. 117, pl. 3, figs. 11, 12.

Upper Burlington limestone; Louisiana and Curryville, Missouri.

Granatocrinus aplatus ROWLEY and HARE, ROWLEY.

1900, American Geologist, vol. 25, p. 67, pl. 2, fig. 15.

Lower Burlington limestone; Louisiana, Pike County, Missouri.

Granatocrinus calycinus ROWLEY.

1900, American Geologist, vol. 25, p. 66, pl. 2, figs. 12-14.

Upper Burlington limestone; Louisiana, Pike County, Missouri.

Granatocrinus concinnulus ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, p. 117, pl. 3, figs. 13, 14.

Lower Burlington limestone; Louisiana, Missouri.

Granatocrinus cornutus MEEK and WORTHEN.

1866, Illinois Geological Survey, vol. 2, p. 276, pl. 20, fig. 1.

St. Louis Group; near Mt. Sterling, Brown County, Illinois.

Granatocrinus curtus (SHUMARD), KEYES.

1894, Missouri Geological Survey, Pal., vol. 4, p. 140 (not fig'd).

St. Louis limestone; Fenton, St. Louis County, Missouri.

Granatocrinus excavatus ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, p. 99, pl. 2, figs. 9, 10.

Burlington limestone; Louisiana, Missouri.

Granatocrinus exiguus ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, No. 7, p. 100, pl. 2, figs. 13, 14.

Lower Burlington limestone; Louisiana, Pike County, Missouri.

Granatocrinus exiguus ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, No. 8, pl. 3, fig. 18.

Lower Burlington limestone; Louisiana, Pike County, Missouri.

Granatocrinus glaber MEEK and WORTHEN.

1869, Proceedings, Philadelphia Academy of Natural Science, p. 91.

St. Louis limestone; Hardin County, Illinois.

Granatocrinus glaber MEEK and WORTHEN.

1873, Illinois Geological Survey, vol. 5, p. 537, pl. 20, fig. 11.
St. Louis limestone; Hardin County, Illinois.

Granatocrinus leda HALL, WHITEAVES.

1889, Canadian Contributions to Paleontology, vol. 1, pt. 2, p. 108, pl. 14, figs. 3 a-f.
Hamilton Group; Thedford, Ontario.

Granatocrinus lotoblastus WHITE.

1871, U. S. Geographical Surveys, 100 meridian, vol. 4, Pal., pp. 80-81, pl. 5, figs. 3 a-b.
Subcarboniferous; Ewell's Spring, Arizona.

Granatocrinus (Schizoblastus?) magnibasis ROWLEY.

1895, American Geologist, vol. 16, p. 220, figs. 11-14.
Upper Burlington limestone; Louisiana, Missouri.

Granatocrinus melonoides MEEK and WORTHEN.

1869, Proceedings, Philadelphia Academy of Natural Science, p. 88.

Granatocrinus melonoides MEEK and WORTHEN.

1873, Illinois Geological Survey Report, vol. 5, p. 468, pl. 9, fig. 1.
Upper Burlington limestone; Burlington, Iowa.

Granatocrinus mutabilis ROWLEY.

1893, American Geologist, vol. 12, pp. 306-307, pl. 14, figs. 4-9.
Chouteau limestone; 3 miles east of Curryville, Pike County, Missouri.

Granatocrinus neglectus MEEK and WORTHEN.

1868, Proceedings, Philadelphia Academy of Natural Science, p. 90.
Lower Burlington limestone; Burlington, Iowa.

Granatocrinus neglectus MEEK and WORTHEN.

1873, Illinois Geological Survey, vol. 5, p. 471, pl. 9, fig. 3.
Burlington limestone; Burlington, Iowa.

Granatocrinus neglectus (MEEK and WORTHEN), KEYES.

1894, Missouri Geological Survey Pal., vol. 4, pp. 139-140 (not fig'd.).
Lower Burlington limestone; Hannibal, Louisiana, Missouri.

Granatocrinus norwoodi SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 375.

Encrinital limestone; Burlington, Iowa, Monmouth, Ill., Hannibal, and St. Louis County, Missouri.

Granatocrinus norwoodi MEEK and WORTHEN.

1866, Proceedings, Philadelphia Academy of Natural Science, p. 258.

Upper Burlington Group; Burlington, Iowa.

Granatocrinus norwoodi O. and S., MEEK and WORTHEN.

1868, Illinois Geological Survey, vol. 3, pp. 496-497, pl. 18, fig. 8.

Burlington limestone; Burlington, Iowa.

Granatocrinus norwoodi MEEK and WORTHEN.

1869, Proceedings, Philadelphia Academy of Natural Science, p. 84.

Granatocrinus norwoodi MEEK and WORTHEN.

1873, Illinois Geological Survey, vol. 5, pp. 465, 473, pl. 9, fig. 2.

Granatocrinus norwoodi WACHSMUTH and SPRINGER.

1881, Proceedings, Philadelphia Academy of Natural Science, pl. 19, fig. 6.

Granatocrinus norwoodi (OWEN and SHUMARD), KEYES.

1894, Missouri Geological Survey, Pal., vol. 4, p. 140, pl. 18, fig. 10.

Upper Burlington limestone; Ash Grove, Palmyra, Hannibal, Missouri.

Granatocrinus pyriformis ROWLEY and HARE.

1891, Kansas City Scientist, vol. 5, p. 118, pl. 3, figs. 15, 16.

Upper Burlington limestone; Bear Creek Station, Marion County, Missouri.

Granatocrinus projectus MEEK and WORTHEN.

1868, Illinois Geological Survey, vol. 3, p. 496, pl. 18, fig. 7.

Burlington limestone; Burlington, Iowa.

Granatocrinus pisum MEEK and WORTHEN.

1869, Proceedings, Philadelphia Academy of Science, p. 89.

Upper Burlington limestone; Burlington, Iowa.

Granatocrinus pisum MEEK and WORTHEN.

1873, Illinois Geological Survey, vol. 5, p. 470, pl. 9, fig. 4.

Burlington limestone; Burlington, Iowa.

Granatocrinus sayi SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 376.

Granatocrinus sayi MEEK and WORTHEN.

1869, Proceedings, Philadelphia Academy of Natural Science, p. 84.

Granatocrinus sayi WACHSMUTH and SPRINGER.

1881, Proceedings, Philadelphia Academy of Natural Science, pl. 19, fig. 3.

Granatocrinus shumardi MEEK and WORTHEN.

1866, Proceedings, Philadelphia Academy of Natural Science, p. 257.
Lower Burlington Group; Burlington, Iowa.

Granatocrinus shumardi MEEK and WORTHEN.

1868, Illinois Geological Survey, vol. 3, pp. 498-499, pl. 18, figs. 6 a-b.
Burlington limestone; Burlington, Iowa.

Granatocrinus sphaeroidalis MILLER and GURLEY.

1894, Illinois State Museum of Natural History, Springfield, Bulletin No. 3, p. 65, pl. 6, figs. 31-33.
Kaskaskia Group; Meade County, Kentucky.

Granatocrinus spinuliferus ROWLEY.

1900, American Geologist, vol. 25, p. 69, pl. 2, figs. 25, 33, 34.
Warsaw? limestone; Grand Tower, Illinois, Wittenberg, Missouri.

Granatocrinus stella ROWLEY.

1900, American Geologist, vol. 25, p. 68, pl. 2, figs. 26-28.
Upper Burlington limestone; Louisiana, Pike County, Missouri.

Granatocrinus winslowi MILLER and GURLEY.

1894, Illinois State Muesum of Natural History, Springfield, Bull. No. 3, p. 66, pl. 6, figs. 34-35.
From drift thought to be Burlington; Danville, Illinois.

Granatocrinus sp.? ROWLEY.

1900, American Geologist, vol. 25, p. 74, pl. 2, fig. 45.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

HETEROSCHISMA

Heteroschisma gracile WACHSMUTH.

1886, Proceedings, Davenport Academy of Natural Science, vol. 4, pp. 84-87. Text figs. 1-2.
Hamilton Group; Alpena, Michigan.

LOPHOBLASTUS

Lophoblastus conoideus ROWLEY.

1901, American Geologist, vol. 27, p. 345, pl. 28, figs. 1-4.
Upper Chouteau limestone; Curryville, Pike County, Missouri.

Lophoblastus marginulus ROWLEY.

1901, American Geologist, vol. 27, p. 345, pl. 28, figs. 18-19.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Lophoblastus pentagonus ROWLEY.

1905, American Geologist, vol. 35, p. 302, pl. 21, figs. 5-8.
Chouteau limestone; Bowling Green, Pike County, Missouri.

MESOBLASTUS

Mesoblastus glaber (MEEK and WORTHEN), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 45.

Mesoblastus glaber MEEK and WORTHEN, BUTTS.

1917, Kentucky Geological Survey, Miss. formations of Western Kentucky, p. 62, pl. 15, figs. 27-31.

Mesoblastus glaber MEEK and WORTHEN, WELLER.

1920, Illinois State Geological Survey, Bull. 41, p. 327, pl. 8, figs. 25-28.
Fredonia limestone, Shetlerville Formation, Renault Formation; Cedar Bluff, Crittenden County, Kentucky, Hardin and Monroe Counties, Illinois.

Mesoblastus glaber? ULRICH.

1905, U. S. Geological Survey Prof. Paper No. 36, p. 57, p. 6, figs. 13-17.
Ohara member of Ste. Genevieve limestone; Crooked Creek, n.-w. of Marion, Kentucky.

Mesoblastus cf. glaber BUTTS.

1926, Alabama Geological Survey, Special Report No. 14, p. 180, pl. 59, fig. 3.
Gasper or Ste. Genevieve; Huntsville, Alabama.

Mesoblastus glaber sphaeroidalis (MILLER and GURLEY), ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 247, pl. 2, fig. 33.

Mesoblastus incurvatus WELLER.

1920, Illinois Geological Survey Bulletin 41, p. 358, pl. 8, figs. 29-34.

Golconda limestone; Flat Rock Ford, Pope County, Illinois.

Mesoblastus kirkwoodensis ROWLEY.

1905, American Geologist, vol. 35, p. 307, pl. 21, figs. 33-34.

Keokuk-Warsaw limestone; Boonville, Cooper County, Missouri.

Mesoblastus 3 species indet. BUTTS.

1926, Alabama Geological Survey, Special Report No. 14, p. 176, pl. 58, figs. 9, 10, 11.

Warsaw limestone; Keller Quarry, Sheffield, Colbert County, Alabama.

METABLASTUS

Metablastus bipyramidalis HALL, KEYES.

1894, Missouri Geological Survey Pal., vol. 4, p. 137, pl. 18, fig. 13.

Keokuk limestone; Boonville, Missouri.

Metablastus bipyramidalis HALL, ROWLEY.

1902, Indiana Contributions to Paleonotology, vol. 1, pt. 10, p. 96, pl. 30, figs. 28-31.

Warsaw; Lanesville, Indiana.

Metablastus bipyramidalis HALL, ROWLEY.

1903, Indiana Contributions to Paleontology, vol. 1, pt. 16, pp. 162-163, pl. 47, figs. 21-24.

Warsaw limestone; Lanesville, Indiana.

Metablastus bipyramidalis HALL, ROWLEY.

1905, American Geologist, vol. 35, p. 307, pl. 21, fig. 28.

Keokuk Group; Boonville, Cooper County, Missouri.

Metablastus lineatus (SHUMARD), KEYES.

1894, Missouri Geological Survey Pal., vol. 4, p. 136, pl. 18, fig. 11.

Upper Burlington; Hannibal, Missouri.

Metablastus lineatus (SHUMARD), ROWLEY.

1905, American Geologist, vol. 35, p. 306, pl. 21, figs. 27, 29-30.
Lower Burlington limestone; Louisiana, Pike County, Missouri.

Metablastus nitidulus ROWLEY.

Indiana Contributions to Paleontology, vol. 1, pt. 12, p. 128, pl. 36, fig. 49.
Warsaw limestone; Lanesville, Indiana.

Metablastus wortheni HALL, KEYES.

1894, Missouri Geological Survey, vol. 4, p. 137, pl. 18, fig. 12.
Keokuk limestone; Boonville, Missouri, Warsaw, Illinois.

Metablastus wortheni HALL, BEEDE.

1905, Indiana Department of Geology and Natural Resources, 30th Annnual Report, (1905) 1906.
Salem limestone; Lanesville, Bloomington, Indiana.

NUCLEOCRINUS

Nucleocrinus angularis LYON and CASSEDAY.

1859, Proceedings, American Association for the Advancement of Science, vol. 4, p. 295.

Nucleocrinus angularis (LYON), ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, pl. 27, figs. 1-4.
Upper Devonian; Charlestown, Indiana.

Nucleocrinus angularis LYON, ROWLEY.

1904 Indiana Contributions to Paleontology, vol. 1, pt. 19, p. 190, pl. 57, figs. 12.
Hamilton Group; Speed's Quarry, Clark County, Indiana.

Nucleocrinus bondi THOMAS.

1920, Iowa Geological Survey, vol. 29, pp. 431-434, pl. 36, figs. 2-5, 12, 18.
Cedar Valley limestone; Sander's Quarry, Iowa City, Iowa.

Nucleocrinus canadensis MONTGOMERY.

1881, Canadian Naturalist and Geologist, vol. 10, p. 83.

Nucleocrinus conradi HALL.

1842, Philadelphia Academy of Natural Science, Journal, vol. 8, p. 280, pl. 15, fig. 17.

Nucleocrinus conradi HALL.

1862, N. Y. State Museum of Natural History, 15th Report, p. 121.

Nucleocrinus cucullatus ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, p. 27, pl. 26, figs. 1-2.
Middle Devonian; Falls of Ohio River.

Nucleocrinus elegans CONRAD.

1842, Journal, Philadelphia Academy of Natural Science, vol. 8, p. 280.
Hamilton Group; Moscow, Livingston County, New York.

Nucleocrinus elegans CONRAD, HALL.

1862, State Cabinet Natural History New York, 15th Report, pp. 147-148, pl. 1, figs. 14-15.
Hamilton Group; Moscow, Livingston County, New York.

Nucleocrinus globosus (TROOST), WOOD.

1909, U. S. National Museum E. Wood, Bull. 64, pp. 19-20, pl. 3, fig. 6.
Bedford County, Tennessee, Falls of the Ohio River.

Nucleocrinus greenei MILLER and GURLEY.

1894, Illinois State Museum of Natural History, Bull. No. 3, p. 62, pl. 6, figs. 24-25.
Upper Helderberg Group; Louisville, Kentucky.

Nucleocrinus greenei M. and G., ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, p. 83, pl. 27, figs. 12-15.
Upper Devonian; Charlestown, Indiana.

Nucleocrinus greenei ROWLEY.

1903, Indiana Contributions to Paleontology, vol. 1, pt. 12, p. 129, pl. 36, fig. 57.
Upper Devonian; Charlestown, Indiana.

Nucleocrinus imitator ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, p. 84, figs. 24-28.
Upper Devonian; Charlestown, Indiana.

Nucleocrinus imitator ROWLEY.

1904, Indiana Contributions to Paleontology, vol. 1, pt. 19, p. 191, pl. 57, figs. 13-15.
Hamilton Group; Speed's Quarry, Clark County, Indiana.

Nucleocrinus lucina HALL.

1862, State Cabinet Nat. History N. Y., 15th Report, p. 148, pl. 1, fig. 16.

Hamilton Group; Livingston County, New York.

Nucleocrinus lucina? HALL, MONTGOMERY.

1881, Canadian Naturalist and Geologist, vol. 10, p. 80 (three wood cuts).

Nucleocrinus lucina HALL, ROWLEY.

1904, Indiana Contributions to Paleontology, vol. 1, pt. 19, p. 192, pl. 57, figs. 19-20.

Hamilton Group; Speed's Quarry, Clark County, Indiana.

Nucleocrinus meloniformis BARRIS, THOMAS.

1920, Iowa Geological Survey, vol. 29, pp. 428-431, pl. 36, figs. 10-11.

Cedar Valley limestone; Buffalo, Iowa.

Nucleocrinus obovatus BARRIS, CLELAND.

1911, Wisconsin Geological and Natural History Survey Bulletin No. 21, p. 43, pl. 3, fig. 2.

Hamilton formation; Milwaukee, Wisconsin.

Nucleocrinus obovatus BARRIS, THOMAS.

1920, Iowa Geological Survey, vol. 29, pp. 423-428, pl. 36, figs. 6-9, 16-17.

Hamilton Group; Alpena, Michigan.

Nucleocrinus stichteri ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, pp. 83-84, pl. 27, figs. 9-11.

Devonian; Charlestown, Indiana.

Nucleocrinus venustus MILLER and GURLEY.

1894, Illinois State Museum of Natural History, Bull. No. 3, Springfield, p. 63, pl. 6, figs. 26-30.

Upper Helderberg Group; Louisville, Kentucky, Columbus, Ohio.

Nucleocrinus venustus M. and G., ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, pp. 82-83, figs. 5-8.

Upper Devonian; Charlestown, Indiana.

Nucleocrinus verneuili LYON and CASSEDAY.

1859, Proceedings, American Academy, vol. 4, p. 295.

Nucleocrinus verneuili TROOST, HALL.

1862, New York State Cabinet of Natural History, 15th Report, p. 149 (not fig'd).

Geol. position not given; Stafford, Genesee County, N. Y.

Nucleocrinus verneuili BILLINGS.

1870, American Journal of Science, vol. 50, p. 229, figs. 3-6.

Nucleocrinus verneuili (TROOST), ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, pl. 26, figs. 9-22, pl. 27, figs. 17-23, pp. 79-81.

Middle Devonian; Falls of the Ohio River.

Nucleocrinus verneuli TROOST, ROWLEY.

1903, Indiana Contributions to Paleontology, vol. 1, pt. 12, pp. 128-129, pl. 36, figs. 52-56.

Middle Devonian; Falls of the Ohio River.

Nucleocrinus verneuili (TROOST), WOOD.

1909, U. S. National Museum, E. Wood, Bulletin 64, pp. 18-19, pl. 3, figs. 7-13.

Bedford County, Tennessee, Falls of the Ohio River.

Nucleocrinus verneuili STAUFFER.

1909, Ohio Geological Survey Bulletin, Ser. 4, No. 10, p. 188.

Columbus limestone.

Nucleocrinus verneuili TROOST, BRANSON.

1922, Geology of Missouri, vol. 17, 2nd Ser., pp. 57-59, pl. 8, figs. 3-4.

Devonian, Mineola limestone; Montgomery County, Missouri.

Nucleocrinus verneuili (TROOST), WESTGATE.

1926, Ohio Geological Survey, Bull. No. 30, Ser. 4, p. 76, pl. 6, fig. 12.

Columbus limestone; Delaware County, Ohio.

Nucleocrinus verneuili var. inflatus ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, p. 78, pl. 26, figs. 3-5.

Middle Devonian; Falls of the Ohio River.

Nucleocrinus verneuili var. pommum? E. and C., ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, p. 79, pl. 26, figs. 16-17.

Middle Devonian; Falls of the Ohio River.

Nucleocrinus verneuili var. sulcatus ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 9, p. 78, pl. 26, figs. 6-8.

Middle Devonian; Falls of the Ohio River.

OLIVANITES

Olivanites angularis LYON.

1857, Kentucky Geological Survey, Third Report, p. 492, pl. 5, figs. 2 a-b.

Corniferous limestone; Kentucky and Ohio.

Olivanites angularis LYON, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 49.

Olivanites conradi (HALL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 49.

Olivanites elegans CONRAD, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

Olivanites globosus TROOST.

1849 (1850), Proceedings, American Assoc. for the Advancement of Science, p. 62, list name only.

Not given; Tennessee.

Olivanites globosus TROOST, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

Olivanites greeni (MILLER and GURLEY), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

Olivanites lucina (HALL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

Olivanites meloniformis (BARRIS), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

Olivanites obovatus (BARRIS), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

Olivanites verneuili TROOST.

1849, American Journal of Science, vol. 8, p. 419, list only.

Not given; Tennessee.

Olivanites verneuili TROOST.

1850, Proceedings, American Association for the Advancement of Science, vol. 2, p. 62.

Olivanites verneuili TROOST, LYON.

1857, Kentucky Geological Survey, Report, vol. 3, p. 487, pl. 5, figs. 1 a-d.

Olivanites verneuili (TROOST), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 50.

ORBITREMITES

Orbitremites grandis ROWLEY.

1902, Indiana Contributions of Paleontology, vol. 1, pt. 10, pp. 96-97, pl. 30, figs. 34-35.

Keokuk Group; Greene County, Kentucky.

Orbitremites granulatus (ROEMER), WOOD.

1909, U. S. National Museum, E. Wood, Bulletin 64, pp. 21-22, pl. 4, figs. 12-17.

Shelbyville, Bedford County, Tennessee, Allen County, Kentucky.

Orbitremites norwoodi (O. and S.), VAN TUYL.

1922, Iowa Geological Survey, vol. 30, pl. 4, figs. 3, 4.

Upper Burlington limestone; Burlington, Iowa.

Orbitremites oppelti ROWLEY.

1902, Indiana Contributions to Paleontology, vol. 1, pt. 10, pp. 86-87, pl. 29, figs. 15-20.

Knobstone Group; 2 miles N. of New Albany, Indiana.

OROPHOCRINUS

Orophocrinus campanulatus (HAMBACH), KEYES.

1894, Missouri Geological Survey Pal., vol. 4, p. 142 (not fig'd.).

Lower Burlington limestone; Sedalia, Missouri.

Orophocrinus conicus WACHSMUTH and SPRINGER.

1890, Illinois Geological Survey, vol. 8, pp. 201-203, pl. 15, figs. 1-3.

LeGrand beds (Kinderhookian); LeGrand, Iowa.

Orophocrinus conicus? ROWLEY.

1905, American Geologist, vol. 35, p. 306, pl. 21, fig. 21.

Lower Burlington limestone; Louisiana, Pike County, Missouri.

Orophocrinus fusiformis WACHSMUTH and SPRINGER.

1890, Illinois Geological Survey, vol. 8, pp. 203-205, pl. 17, fig. 4.

LeGrand Beds (Kinderhookian); LeGrand, Iowa.

Orophocrinus stelliformis (OWEN and SHUMARD), KEYES.

1894, Missouri Geological Survey Pal., vol. 4, pp. 141-142, pl. 18, figs. 14 a-b.

Lower Burlington limestone; Hannibal, Louisiana, Sedalia, Springfield, Missouri.

Orophocrinus stelliformis (OWEN and SHUMARD), ROWLEY.

1905, American Geologist, vol. 35. p. 305. pl. 21, figs. 20, 22-24.

Lower Burlington limestone; Louisiana, Pike County, Missouri.

Orophocrinus whitei HALL, WHITFIELD.

1893, American Museum of Natural History Memoir, vol. 1, p. 36, pl. 3, figs. 25-28.

PENTREMITES

Pentremites abbreviatus HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, pp. 155-156, pl. B., fig. 3.

Kaskaskia limestone; Evansville, Illinois.

Pentremites abruptus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 257, pl. 6, figs. 10-14.

Gasper and Paint Creek formations; Huntsville, Alabama; Cowen, Tennessee; Floraville, Illinois.

Pentremites altimarginatus CLARK.

1917, Bulletin Museum of Comparative Zoology, vol. 61, No. 9, p. 366, pl. 1, figs. 11-13.

Mississippian Quadrant formation; Old Baldy, near Virginia City, Montana.

Pentremites altus ROWLEY.

1901, Contributions to Indiana Paleontology, vol. 1, No. 8, p. 64, pl. 23, figs. 1-3.

Kaskaskia; Newman's Ridge, Tennessee, Bowling Green, Kentucky.

Pentremites angularis LYON.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 631, pl. 20, figs. 3 a-c.

Third limestone of Millstone-grit beds; Falls of Rough Creek, Breckenridge County, Kentucky.

Pentremites angustus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, pp. 53-54, text figs. 14 a-b.

Chester limestone; Washington County, Arkansas.

Pentremites angustus HAMBACH, MATHER.

1916, Bulletin of the Scientific Laboratories of Denison University, vol. 18, 1915-1916, pp. 100-101, pl. 3, figs. 10-13.

Hale Formation, Brentwood limestone; Fayetteville and Brentwood, Arkansas; Fort Gibson, Oklahoma.

Pentremites arctibrachiatus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 248, pl. 2, figs. 37-40.

Gasper and Paint Creek formation; Huntsville, Alabama; Floraville, Illinois.

Pentremites arctibrachiatus huntsvillensis ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 248, pl. 2, figs. 41-42.

Gasper; Huntsville, Alabama.

Pentremites basilaris HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, pp. 159-160, pl. B., fig. 9.

Kaskaskia limestone; Evansville, Chester, Illinois.

Pentremites benedicti ROWLEY.

1900, American Geologist, vol. 25, p. 69, pl. 2, figs. 29-32.

Warsaw limestone; Grand Tower, Illinois; Wittenberg, Missouri.

Pentremites biconvexus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 247, pl. 2, figs. 34-36.

Gasper oolite; Bowling Green, Kentucky.

Pentremites biconvexus ULRICH, BUTTS.

1926, Geological Survey of Alabama, Special Report, No. 14, p. 180, pl. 59, fig. 2.

Gasper oolite; Blount Springs, Alabama.

Pentremites bipyramidalis HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, p. 607, pl. 15, fig. 2.

Keokuk limestone; Missouri.

Pentremites bradleyi MEEK.

1873, Geological Survey of the Territories, 6th Ann. Report, F. V. Hayden, p. 470 (not figured).

Carboniferous; Divide between Ross Fork and Lincoln Valley, Montana.

Pentremites bradleyi MEEK, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 56, pl. 5, fig. 7.

Subcarboniferous; Divide between Ross Fork and Lincoln Valley, Montana.

Pentremites bradleyi MEEK, CLARK.

1917, Bulletin Museum of Comparative Zoology, vol. 61, No. 9, p. 368 (listed, not figured).

Subcarboniferous; Divide between Ross Fork and Lincoln Valley Montana.

Pentremites brevis ULRICH, BUTTS.

1917, Kentucky Geological Survey Miss. formations of Western Kentucky, p. 100, pl. 24, fig. 6.

Glen Dean limestone; Kentucky.

Pentremites brevis ULRICH, WELLER.

1920, Illinois State Geological Survey, Bull. 41, pp. 369, 370, pl. 4, figs. 43-46.

Upper Okaw, Glen Dean limestone; Randolph County, Hardin County, Illinois.

Pentremites brevis ULRICH, BUTTS.

1926, Alabama Geological Survey, Special Report No. 14, p. 198, pl. 65, fig. 3.

Bangor limestone, Glen Dean Horizon; Paint Rock River, Marshall County, Alabama.

Pentremites broadheadi HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, p. 159, pl. B., fig. 6.

Kaskaskia limestone; Evansville, Illinois.

Pentremites burlingtonensis MEEK and WORTHEN.

1870, Proceedings, Philadelphia Academy of Science, p. 33.

Upper Burlington limestone; Burlington, Iowa.

Pentremites burlingtonensis MEEK and WORTHEN.

1873, Illinois State Geological Survey, vol. 5, p. 461, pl. 8, fig. 7.

Burlington limestone; Burlington, Iowa.

Pentremites buttsi ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 245, pl. 2, figs. 18-19.

Ohara limestone; Shetlerville, Hardin County, Illinois.

Pentremites buttsi ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 61, pl. 15, figs. 8, 9.

Ohara limestone; Kentucky.

Pentremites buttsi ULRICH, WELLER.

1920, Illinois State Geological Survey Bulletin 41, pp. 323-324, pl. 4, figs. 16-20.

Renault limestone; Monroe, St. Clair, Union and Hardin Counties, Illinois.

Pentremites calyce HALL.

1862, 15th Report State Cabinet of Natural History, N. Y., p. 150 (not figured).

Hamilton shales; Western New York.

Pentremites calycinus LYON.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 628, pl. 20, figs. 1 a-c.

Second limestone of Millstone-grit beds; Eskridge's Ferry, Grayson County, Kentucky.

Pentremites calycinus LYON, ROWLEY.

1903, Contributions of Indiana Paleontology, vol. 1, pt. 12, p. 125, pl. 36, figs. 39-40.

Kaskaskia limestone; Clifty Station, Hardin County, Kentucky.

Pentremites canalis ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 262, pl. 7, figs. 23-26.

Glen Dean limestone; Sloan's Valley, Kentucky.

Pentremites canalis ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 100, pl. 24, fig. 7.

Glen Dean limestone; Kentucky.

Pentremites carioides OWEN.

1843, Catalogue of Geological Specimens from the Ohio Valley.

Pentremites cavus ULRICH.

1905, U. S. Geological Survey Prof. Paper No. 36, p. 57, pl. 6, figs. 7-8.

Lower St. Louis limestone; Princeton, Kentucky.

Pentremites cavus ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 45, pl. 10, figs. 18-19.

St. Louis limestone; Princeton, Kentucky.

Pentremites cervinus HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, pp. 690-691, pl. 25, fig. 11 a-b.

Miss. Kaskaskia limestone; Chester, Illinois; Huntsville, Alabama.

Pentremites clavatus HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, p. 157, pl. B., fig. 5.

Kaskaskia limestone; Evansville, Illinois.

Pentremites cherokeeus TROOST.

1850, Proceedings, American Assoc. for the Advancement of Science, vol. 2, p. 60.

Pentremites cherokeeus HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, pp. 691-692, pl. 25, figs. 12 a-b.

Miss. Kaskaskia limestone; Chester, Illinois; Prairie du Long, Illinois; Huntsville, Alabama; Cherokee County, Tennessee.

Pentremites cherokeeus TROOST, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, pp. 116-117, pl. 36, fig. 6.

Kaskaskia limestone; Clifty Station, Hardin County, Tennessee.

Pentremites cherokeeus HALL, WELLER.

1920, Illinois State Geological Survey, Bull. 41, pp. 371-372, pl. 10, figs. 11-13.

Menard limestone; Randolph and Johnson Counties, Illinois.

Pentremites chesterensis HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, pp. 158-159, pl. B., fig. 8.

Kaskaskia limestone; Chester, Randolph County, Illinois.

Pentremites chesterensis HAMBACH, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 117, pl. 36, figs. 7-11.

Kaskaskia Group; Big Clifty, Bowling Green, Kentucky.

Pentremites conoideus HALL.

1856, Transactions, Albany Institute, vol. 4, p. 5.

St. Louis limestone; Spergen Hill, Bloomington, Indiana.

Pentremites conoideus HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, p. 655, pl. 22, figs. 8, 9, 10.

Miss. Warsaw limestone; Spergen Hill and Bloomington, Indiana.

Pentremites conoideus HALL, SHUMARD.

1858, Transactions, St. Louis Academy of Science, vol. 1, pt. 2, pp. 243, 246, pl. 9, fig. 4.

Pentremites conoideus HALL, SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, pp. 383-384.

Pentremites conoideus HALL, BILLINGS.

1869, American Journal of Science, vol. 48, p. 81, fig. 15.

Pentremites conoideus HALL, MEEK.

1873, Geological Survey of the Territories, 6th Ann. Rept., p. 470 (not figured).

Carboniferous; Divide between Ross Fork and Lincoln Valley, Montana.

Pentremites conoideus HALL, WHITE.

1880, Second Annual Report, Department of Statistics and Geology, Indiana, p. 512, pl. 7, fig. 12.

Pentremites conoideus HALL, WHITFIELD.

1882, Bulletin American Museum of Natural History, vol. 1, No. 3, pp. 43-44, pl. 9, figs. 32, 33.

Pentremites conoideus HALL.

1883, Twelfth Annual Report, Department of Geology and Natural History, Indiana, p. 323, pl. 32, fig. 32.

Pentremites conoideus HALL, KEYES.

1894, Missouri Geological Survey Paleontology, vol. 4, p. 134, pl. 18, fig. 5.

Keokuk limestone; Boonville, Mo.

Pentremites conoideus HALL, ROWLEY.

1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, p. 87, pl. 29, figs. 37-41.

Warsaw?

Pentremites conoideus HALL, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 126, pl. 36, figs. 41-44.

Warsaw limestone; Lanesville, Indiana.

Pentremites conoideus HALL, ULRICH.

1905, U. S. Geological Survey Prof. Paper No. 36, p. 57, pl. 6, figs. 1-6.

Lower St. Louis limestone; Princeton, Kentucky.

Pentremites conoideus HALL, ROWLEY.

1905, American Geologist, vol. 35, p. 306, pl. 21, figs. 25-26.

Warsaw limestone; Grand Tower, Illinois.

Pentremites conoideus HALL, BEEBE.

1906, Indiana Department of Geology and Natural Resources, 30th Annual Report, (1905) 1906, p. 1263, pl. 26, figs. 32-33.

Warsaw limestone; Lanesville, Indiana.

Pentremites conoideus HALL, SMITH.

1906, Indiana Department of Geology and Natural Resources, 30th Annual Report (1905) 1906, pp. 1219-1242 (discussion) text figs. 1-3, pls. 43-47.

Salem, Harrodsburg limestone; Harrodsburg, Bloomington, Spergen Hill, Ellettsville, Stinesville, Indiana.

Pentremites conoideus HALL, CLARK.

1917, Bulletin, Museum of Comparative Zoology, vol. 61, No. 9, p. 369 (not figured).

Carboniferous; Old Baldy, near Virginia City, Montana.

Pentremites conoideus HALL, BUTTS.

1917, Kentucky Geological Survey, Mississippian formations of Western Kentucky, p. 45, pl. 10, figs. 18, 19.

St. Louis limestone; Princeton, Kentucky.

Pentremites conoideus HALL, BUTTS.

1926, Alabama Geological Survey, Special Report No. 14, p. 180, pl. 59, fig. 10.

Warsaw limestone; Blount Springs, Alabama.

Pentremites conoideus HALL, PECK.

1930, Pan-American Geologist, vol. 54, p. 106, pl. 14, figs. 6-8, Brazer limestone (Miss.) ; Mendon, Utah.

Pentremites conoideus amplus ROWLEY.

1902, Contributions to Indiana Paleontology, pt. 10, p. 88, pl. 29, figs. 31, 32, 33-34.
Warsaw limestone; Lanesville, Indiana.

Pentremites conoideus amplus ROWLEY, BEEDE.

1906, Indiana Department of Geology and Natural Resources, 30th Annual Report (1905) 1906, p. 1263, pl. 7, figs. 8 a-c.
Warsaw limestone; Lanesville, Indiana.

Pentremites conoideus perlongus ROWLEY.

1902, Contributions to Indiana Paleontology, pt. 10, p. 87, pl. 29, fig. 28.
Warsaw limestone; Lanesville, Indiana.

Pentremites conoideus perlongus ROWLEY, BEEDE.

1906, Indiana Department of Geology and Natural Resources, 30th Annual Report (1905), 1906, p. 1263, pl. 7, fig. 7.
Warsaw limestone; Lanesville, Indiana.

Pentremites conoideus var. ? BUTTS.

1926, Geological Survey of Alabama, Special Report, No. 14, p. 176, pl. 58, fig. 1.
Warsaw limestone; Keller Quarry, Sheffield, Colbert County, Alabama.

Pentremites cornutus MEEK & WORTHEN.

1861, Proceedings, Philadelphia Academy of Natural Sciences, p. 141.
St. Louis limestone; Dry Fork, Brown County, Illinois.

Pentremites curtus SHUMARD.

1855, The 1st and 2nd Annual Reports of the Geological Survey of Missouri, by G. C. Swallow, Jefferson City, p. 187, pl. 13, figs. 3 a-b.
Archimedes limestone; Fenton, St. Louis County, Missouri.

Pentremites decipiens ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 254, pl. 5, figs. 31-33.
Gasper oolite and Paint Creek Formations; Kentucky, Tennessee, Alabama and Illinois.

Pentremites decipiens decurtatus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 255, pl. 5, figs. 34-35.

Gasper oolite; Breckenridge County, Kentucky and Cowen, Tennessee.

Pentremites decussatus SHUMARD.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 242, pl. 9, figs. 6 a-b.

Base of Carboniferous; Button-Mould Knob, 7 miles south of Louisville, Kentucky.

Pentremites decussatus SHUMARD, WELLER.

1909, Bulletin, Geological Society of America, vol. 20, 1909, pp. 288-289, pl. 11, figs. 28-29.

Fern Glen formation; Fern Glen, St. Louis County, Missouri.

Pentremites divergens CLARK.

1917, Bulletin Museum Comparative Zoology, vol. 61, No. 9, p. 365, plate 1, figs. 7-10.

Miss. Quadrant formation; Old Baldy, near Virginia City, Montana.

Pentremites elegans LYON.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 632, pl. 20, figs. 4 a-c.

Third limestone of Millstone-grit beds; Grayson Springs and three miles north of Litchfield, Grayson Springs, Kentucky.

Pentremites elegans LYON, WHITFIELD.

1891, Annals New York Academy of Science, p. 577, pl. 13, fig. 4.

Pentremites elegans LYON, WHITFIELD.

1893, Ohio Geological Survey, vol. 7, p. 466, pl. 9, fig. 4.
Maxville limestone; Newtonville, Ohio.

Pentremites elegans LYON, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 37.

Pentremites elegans LYON, WOOD.

1909, Bulletin 64, U. S. National Museum, pp. 14-15, pl. 2, figs. 10, 11, 12.

Sequatchie Valley, Sparta, Tennessee; Mount Sano, Alabama.

Pentremites elegans LYON, MORSE.

1911, Proceedings, Ohio Academy of Science, vol. 5, No. 7, p. 360, fig. 2.
Maxville limestone.

Pentremites elongatus SHUMARD.

1855, The 1st and 2nd Annual Reports of the Missouri Geological Survey by G. C. Swallow, pp. 187-188, pl. B, fig. 4.

Encrinital limestone; Clarksville, Columbia and Rocheport, Missouri.

Pentremites elongatus SHUMARD.

1858, Transactions, St. Louis Academy of Science, vol. 1, pt. 2, p. 244.

Pentremites elongatus SHUMARD, LYON & CASSEDAY.

1860, Proceedings, American Academy, vol. 4, p. 296.

Pentremites elongatus SHUMARD, WHITE.

1863, Boston Journal of Natural History, vol. 7, p. 488.

Pentremites elongatus SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 384.

Pentremites elongatus SHUMARD, KEYES.

1894, Missouri Geological Survey Paleontology, vol. 4, pp. 133-134, pl. 18, fig. 4, pl. 21, fig. 12.

Upper Burlington limestone; Palmyra, Hannibal, Louisiana, Columbia, Rocheport, and Ash Grove, Missouri.

Pentremites florealis SAY.

1825, Journal, Philadelphia Academy of Natural Sciences, 4, p. 295.

Kentucky.

Pentremites florealis SAY, TROOST.

1835, Transactions, Pennsylvania Geological Society, vol. 1, pt. 2, p. 224, pl. 10, figs. 10-11.

Pentremites florealis SAY, TROOST.

1850, Proceedings, American Association for the Advancement of Science, vol. 2, p. 60.

Pentremites florealis SAY, OWEN & SHUMARD.

1852, Geological Report, Wisconsin, Iowa, and Minnesota, p. 592.

Pentremites florealis SAY, SHUMARD.

1853, Marcy's Expl. Red River of Louisiana, 1852, p. 200, Washington, 1853.

Lower carboniferous; Washington and Crawford County, Arkansas.

Pentremites florealis SAY, HARRIS.

1896, Bulletins of American Paleontology, vol. 1, No. 5, p. (83). 352. A Reprint of the Paleontological writings of Thomas Say.

Kentucky, near Huntsville, Alabama.

Pentremites florealis SAY, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 37, text fig. 12c.

Pentremites florealis SAY, WOOD.

1909, Bulletin 64, U. S. National Museum, pp. 15-16, pl. 3, fig. 1.

Sparta, Tennessee; Mount Sano, Alabama; Russelville, Kentucky.

Pentremites florealis var. elongatus TROOST.

1850, Proceedings, American Association for the Advancement of Science, vol. 2, p. 60.

Pentremites fohsi ULRICH.

1905, U. S. Geological Survey, Professional Paper, No. 36, p. 64, pl. 7, figs. 5-9.

Birdsville formation; Princeton, Marion, Kentucky.

Pentremites fohsi ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 101, pl. 24, fig. 21.

Glen Dean formation; Marion, Kentucky.

Pentremites fohsi ULRICH, WELLER.

1920, Illinois State Geological Survey Bulletin 41, pp. 370-371, pl. 10, fig. 4.

Menard limestone; Union, Johnson and Pope Counties, Illinois.

Pentremites fohsi marionensis ULRICH.

1905, United States Geological Survey, Professional Paper, No. 36, p. 64, pl. 7, figs. 10-11.

Birdsville formation; Marion, Kentucky.

Pentremites gemmiformis HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, p. 553, pl. D, fig. 5.

Kaskaskia limestone; Randolph County, Illinois.

Pentremites gemmiformis HAMBACH, ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 260, pl. 7, figs. 1-7.

Upper Gasper and Paint Creek; Evansville, Illinois and Scottsburg, Kentucky.

Pentremites gemmiformis HAMBACH, WELLER.

1920, Illinois State Geological Survey, Bulletin 41, p. 326, pl. 10, figs. 9-10.

Paint Creek limestone; St. Clair and Randolph Counties, Illinois.

Pentremites girtyi ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 261, pl. 7, figs. 11-16.

Gasper oolite; Breckenridge, Todd and Caldwell Counties, Kentucky.

Maxville limestone; Newtonville, Ohio.

Paint Creek formation; Monroe County, Illinois.

Pentremites globosa TROOST.

1835, Transactions, Pennsylvania Geological Society, vol. 1, pt. 2, p. 228.

Chester Ser.; Mount Sano, Alabama; Crab Orchard Mountain, Tennessee, and Illinois.

Pentremites globosa TROOST, CHRISTY.

1848, Christy's Letters on Geology, pl. 4, figs. 7-8.

Pentremites globosus TROOST, HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, pp. 695-696, pl. 25, fig. 17.

Kaskaskia limestone; Hardin County, Illinois.

Pentremites (Encrina) godoni DEFRANCE.

1819, Dict. Sci. Nat., Vol. XIV, p. 467.

Pentremites godoni DEFRANCE, HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, pp. 692-693, pl. 25, figs. 13 a, b.

Kaskaskia limestone; Chester, Illinois; Huntsville, Alabama.

Pentremites godoni DEFRANCE, SHUMARD.

1858, Transactions, St. Louis Academy of Science, vol. 1, No. 2, p. 245.

Pentremites godoni DEFRANCE, LYON & CASSEDAY.

1860, Proceedings, American Academy, vol. 4, p. 296.

Pentremites godoni DEFRANCE, SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 384.

Pentremites godoni DeFrance, Billings.
1869, American Journal Science, vol. 48, p. 81, fig. 13.

Pentremites godonii DeFrance, Safford.
1869, Geology of Tennessee, p. 359, text figs. 2 a-b.
Chester Group; Cowan and other localities, Tennessee.

Pentremites godoni DeFrance, Meek.
1873, Geological Survey of the Territories, 6th Annual Report, p. 470 (not figured).
Carboniferous; divide between Ross Fork and Lincoln Valley, Montana.

Pentremites godoni DeFrance, White.
1881, Second Annual Report, Department of Statistics and Geology, Indiana, p. 511, pl. 7, figs. 10-11.
Chester Group; Dubois, Harrison and Crawford County, Indiana.

Pentremites godoni DeFrance, Keyes.
1894, Missouri Geological Survey Paleontology, vol. 4, p. 136 (not figured).
Kaskaskia limestone; St. Marys, Missouri.

Pentremites godoni DeFrance, Rowley.
1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, p. 97, pl. 30, figs. 36, 39.
Kaskaskia limestone; Warren County, Kentucky.

Pentremites godoni DeFrance, Rowley.
1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, pp. 89-90, pl. 29, figs. 1-3, 7-8.
Kaskaskia limestone; Bowling Green, Kentucky.

Pentremites godoni DeFrance, Rowley.
1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 125, pl. 36, figs. 37-38.
Kaskaskia; Bowling Green, Kentucky.

Pentremites godoni DeFrance, Rowley.
1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, pp. 121-125, pl. 36, figs. 18-38.
Kaskaskia Group; Bowling Green, Kentucky.

Pentremites godoni DeFrance, Hambach.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 38, pl. 3, fig. 18.

Pentremites godoni DeFrance, Wood.

1909, Bulletin 64, United States National Museum, p. 13, pl. 3, fig. 5.

Chester series; Sparta, Bledsoe County, Tennessee; Huntsville, Mount Sano, Alabama; Illinois and Kentucky.

Pentremites godoni DeFrance, Ulrich.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 254, pl. 5, figs. 17-30.

Gasper limestone; Huntsville, Alabama; near Scottsburg, Kentucky.

Paint Creek formation; Floraville, Illinois.

Pentremites godoni DeFrance, Butts.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 78, pl. 21, figs. 20-23.

Gasper oolite; Kentucky and Illinois.

Pentremites godoni DeFrance, Clark.

1917, Bulletin Museum Comparative Zoology, vol. 61, No. 9, p. 370 (mentioned, not figured).

Carboniferous; divide between Ross Fork and Lincoln Valley, Montana.

Pentremites godoni DeFrance, Weller.

1920, Illinois State Geological Survey, Bulletin 41, pp. 319-322, pl. 4, figs. 31-36, 47.

Renault limestone and Paint Creek formation; Monroe, Randolph, Hardin and St. Clair Counties, Illinois.

Pentremites godoni DeFrance, Butts.

1926, Geological Survey of Alabama, Special Report No. 14, p 180, pl. 59, figs. 7-9.

Gasper oolite; Huntsville, Alabama.

Pentremites godoni DeFrance, Peck.

1930, Pan-American Geology, vol. 54, p. 107, pl. 14, figs. 1-5. Brazer limestone (Miss.); Mendon, Utah.

Pentremites godoni DeFrance, Morse.

1930, Mississippi State Geological Survey, Bull. 23, pl. 13, figs. 1, 2.

Chester, Southward Pond formations; Mouth of Pennywinkle Creek, Alabama.

Pentremites godoni biconvexi Ulrich, Butts.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 78, pl. 21, figs. 18-19.

Pentremites (Granatocrinus?) granulosus MEEK & WORTHEN.

1865, Proceedings, Philadelphia Academy of Natural Sciences, p. 165.

Keokuk Group; Warsaw, Illinois.

Pentremites hambachi BUTTS.

1926, Geological Survey of Alabama, Special Report No. 14, p. 198, pl. 65, fig. 2.

Bangor limestone, Glen Dean horizon; Paint Rock River, Marshall County, Alabama.

Pentremites hemisphericus HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, pp. 157-158, pl. B, fig. 7.

Kaskaskia limestone; Chester and Evansville, Illinois.

Pentremites (Codaster?) kentuckyensis SHUMARD.

1858, Transactions, St. Louis Academy of Science, vol. 1, p. 239, pl. 9, fig. 5.

Base of Carboniferous; Button-Mould Knob, near Louisville, Kentucky.

Pentremites kirki HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 55, pl. 5, fig. 18.

Lower Burlington limestone.

Pentremites koninckana HALL.

1856, Transactions, Alabana Institute, vol. 4, p. 4.

St. Louis limestone; Spergen Hill and Bloomington, Indiana; Alton, Illinois.

Pentremites koninckana HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, p. 656, pl. 22, figs. 11 a, b, c.

Warsaw limestone; Spergen Hill and Bloomington, Indiana; Alton, Illinois.

Pentremites koninckiana HALL.

1860, Supp. to vol. 1, pt. 2, Geological Report of Iowa, pl. 1, figs. 2 a-c.

Pentremites koninckana HALL, WHITFIELD.

1882, Bulletin, American Museum of Natural History, vol. 1, p. 43, pl. 9, fig. 33.

St. Louis group; Spergen Hill and Bloomington, Indiana; Alton, Illinios.

Pentremites koninckana HALL.

1883, Indiana Geological Survey, 12th Annual Report, p. 322, p. 32, fig. 33.

St. Louis group; Spergen Hill, Lanesville and Bloomington, Indiana.

Pentremites koninckanus HALL, KEYES.

1894, Missouri Geological Survey, Paleontology, vol. 4, p. 135 (no figures).

St. Louis limestone; St. Louis, Missouri; Pella, Oskaloosa, Iowa.

Pentremites koninckanus HALL, ROWLEY.

1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, p. 90, pl. 29, figs. 5-6, 9, 10, 11, 13, 14.

Warsaw formation; Lanesville, Indiana.

Pentremites koninckanus HALL, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 26, pl. 36, fig. 45.

Warsaw limestone; Lanesville, Indiana.

Pentremites koninckanus HALL, ROWLEY.

1904, Contributions to Indiana Paleontology, vol. 1, pt. 19, p. 190, pl. 57, figs. 10-11.

Warsaw group; Lanesville, Indiana.

Pentremites laterniformis OWEN and SHUMARD.

1850, Journal, Philadelphia Academy of Natural Sciences, vol. 2, p. 66, pl. 7, fig. 15.

Carboniferous; Mill Creek, Randolph County, Illinois.

Pentremites laterniformis OWEN and SHUMARD.

1852, Report of the Geological Survey of Wisconsin, Iowa, and Minnesota, by David Dale Owen, pp. 592-593, pl. V, fig. 15.

Mississippian, subcarboniferous; Randolph County, Illinois, on Mill Creek.

Pentremites leda HALL.

1862, 15th Report, State Cabinet of Natural History of New York, p. 149, pl. 1, fig. 11.

Hamilton shales; Western New York.

Pentremites lineatus SHUMARD.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 241, pl. 9, figs. 3 a-b.

Encrinital limestone; Monmouth, Illinois.

Pentremites longicostalis HALL.

1860, Supplement to vol. 1, pt. 2, Geological Report of Iowa, p. 85.

Warsaw limestone; Warsaw, Illinois.

Pentremites lycorias HALL.

1862, 15th Report, State Cabinet of Natural History of New York, p. 151.

Hamilton group; Western New York.

Pentremites lyoni ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 262, pl. 7, figs. 27-29.

Golconda, Glen Dean and Okaw formations; Kentucky, Illinois, Tennessee, Alabama, and Georgia.

Pentremites lyoni gracilens ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 263, pl. 7, figs. 30-32.

Golconda, Glen Dean, Okaw and Birdsville formations; Kentucky, Illinois, Tennessee, and Alabama.

Pentremites maia HALL.

1862, 15th Report, State Cabinet of Natural History of New York, p. 150, pl. 1, fig. 10.

Hamilton group; Moscow, New York.

Pentremites maccalliei SCHUCHERT.

1906, Proceedings, United States National Museum, vol. 30, pp. 759-760, text figures 1, 2, 3.

Bangor limestone; Nickajack Gulch, Cole City, Georgia.

Pentremites melo OWEN and SHUMARD.

1850, Journal, Philadelphia Academy of Natural Sciences, vol. 2, pt. 1, p. 65, pl. 17, fig. 4 a-c.

Pentremites melo OWEN and SHUMARD.

1852, Report of a Geological Survey of Wisconsin, Iowa and Minnesota by David Dale Owen, p. 592, pl. V, figs. 14 a, b, c.

Mississippian, Burlington limestone; Burlington, Iowa.

Pentremites melo var. projectus MEEK and WORTHEN.

1861, Proceedings, Philadelphia Academy of Natural Sciences, p. 142.

Burlington limestone; Burlington, Iowa.

Pentremites missouriensis SWALLOW.

1860, Transactions, St. Louis Academy of Science, vol. 2, p. 81.
Archimedes limestone; Missouri and Illinois.

Pentremites nodosus HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, p. 155, pl. B, fig. 2.
Kaskaskia limestone; Randolph County, Illinois.

Pentremites nodosus HAMBACH, WELLER.

1920, Illinois Geological Survey, Bulletin 41, p. 356, pl. 4, fig. 25.
Lower Okaw limestone; Randolph County, Illinois.

Pentremites norwoodi OWEN and SHUMARD.

1850, Journal, Academy of Natural Sciences of Philadelphia, (2) Vol. 2, p. 64, pl. 7, figs. 13 a-c.
Subcarboniferous limestone; Burlington and Augusta, Iowa; Oquawka, Illinois.

Pentremites norwoodi OWEN and SHUMARD.

1852, Report of a Geological Survey of Wisconsin, Iowa and Minnesota by David Dale Owen, Philadelphia, pp. 591-592, pl. V, figs. 13 a, b, c.
Burlington limestone; Burlington and Augusta, Iowa; Oquawka, Illinois.

Pentremites norwoodi OWEN and SHUMARD, WHITE.

1863, Journal, Boston Society of Natural History, vol. 7, No. 4, p. 483.

Pentremites obesus LYON.

1857, Report, Kentucky Geological Survey, vol. 3, p. 469, pl. 2, figs. 1-1d.
Lower Carboniferous beds of the Millstone Grit; Crittenden County, Kentucky.

Pentremites obesus LYON, HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, p. 695, pl. 25, fig. 15.
Kaskaskia limestone; Southern Illinois and Kentucky.

Pentremites obesus LYON, KEYES.

1894, Missouri Geological Survey, Paleontology, vol. 4, p. 135, (not figured).
Kaskaskia limestone; St. Marys, Missouri.

Pentremites obesus LYON, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, pp. 115-116, pl. 36, figs. 1-3.

Kaskaskia limestone; Grayson Springs, Kentucky.

Pentremites obesus LYON, ULRICH.

1905, United States Geological Survey Prof. Paper, No. 36, p. 64, pl. 7, figs. 1-4.

Birdsville formation; Crittenden County, Kentucky.

Pentremites obesus LYON, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 95, pl. 23, figs. 7-9.

Golconda formation; Illinois, Kentucky.

Pentremites obesus LYON, WELLER.

1920, Illinois Geological Survey, Bulletin 41, p. 355, pl. 10, figs. 1-3.

Golconda limestone; Pope County, Illinois; Crittenden County, Kentucky.

Pentremites obliquatus? ROEMER, SAFFORD.

1869, Geology of Tennessee, p. 346, pl. 6, figs. 2 a-d.

St. Louis group; Clarksville, Tennessee.

Pentremites (Tricoelocrinus) obliquatus ROEMER, MEEK and WORTHEN.

1875, Illinois Geological Survey, vol. 6, p. 521, pl. 31, fig. 4.

Warsaw beds; Monroe County, Illinois.

Pentremites obtusus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 53, text fig. 13.

Warsaw limestone; Boonville, Missouri.

Pentremites okawensis WELLER.

1920, Illinois Geological Survey, Bulletin 41, p. 357, pl. 10, figs. 5-7.

Okaw limestone, Glen Dean limestone, Golconda limestone; Randolph, Pope and Hardin Counties, Illinois.

Pentremites okawensis WELLER, BUTTS.

1926, Geological Survey of Alabama, Special Report, No. 14, p. 198, pl. 65, fig. 4.

Bangor limestone, Glen Dean horizon; Paint Rock River, Marshall County, Alabama.

Pentremites ovoides ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 61, pl. 15. figs. 6, 7.

Ohara limestone; Livingston County, Kentucky.

Pentremites patei ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 261, pl. 7, figs. 17-22.

Gasper oolite and Glen Dean formations; Breckenridge, Todd and Caldwell Counties, Kentucky; Monroe County, Illinois, and near Huntsville, Alabama.

Pentremites pediculatus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 248, pl. 2, fig. 44.

Gasper oolite; Bowling Green, Kentucky.

Pentremites pinguis ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 244, pl. 2, figs. 16-17.

Fredonia oolite and Upper Ohara; View and Carrsville, Kentucky.

Pentremites pinguis ULRICH, WELLER.

1920, Illinois State Geological Survey, Bulletin 41, pp. 317-319, pl. 4, figs. 8-12.

Shetlerville formation, Renault limestone; Hardin County, Randolph County, Illinois.

Pentremites planus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 253, pl. 5, figs. 1-13.

Gasper oolite; Cowan, Tennessee; Bowling Green, Kentucky.
Paint Creek formation; Floraville, Illinois.

Pentremites planus var. ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 253, pl. 5, figs. 14-16.

Gasper oolite; Cowan, Tennessee; Bowling Green, Kentucky.
Paint Creek formation; Floraville, Illinois.

Pentremites platybasis WELLER.

1920, Illinois Geological Survey, Bulletin No. 41, p. 355, pl. 4, figs. 37-42.

Lower Okaw limestone; Randolph and St. Clair Counties, Illinois; Pope and Hardin Counties, Kentucky.

Pentremites potteri HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, p. 156, pl B, fig. 4.

Burlington limestone; Burlington, Iowa.

Pentremites prematurus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 245, pl. 2, fig. 20.

Ohara limestone; Shetlersville, Illinois.

Pentremites princetonensis ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 243, pl. 2, figs. 8-13.

Fredonia oolite; Princeton, Kentucky.
Ohara limestone; Marion and Carrsville, Kentucky.
Renault and Paint Creek formations; Illinois.
Ste. Genevieve limestone; Missouri.

Pentremites princetonensis ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 59, pl. 14, fig. 17.

Fredonia oolite; Breckenridge County, Kentucky.

Pentremites princetonensis vars. ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippi Formations of Western Kentucky, p. 62, pl. 15, figs. 10-26.

Ohara limestone; Kentucky and Illinois.

Pentremites princetonensis ULRICH, WELLER.

1920, Illinois State Geological Survey, Bulletin 41, pp. 314-316, pl. 4, figs. 1-7.

St. Louis limestone to lower Chester; Illinois and Missouri.

Pentremites princetonensis ULRICH, BUTTS.

1926, Geological Survey of Alabama, Special Report No. 14, p. 181, pl. 59, fig. 32.

Ste. Genevieve limestone; Huntsville, Alabama.

Pentremites pulchellus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 242, pl. 2, figs. 1-7.

Fredonia oolite; Princeton, Baker's Station, Carrsville, Marion, Kentucky. Mont Sano limestone; Huntsville, Alabama.

Paint Creek formation and Renault limestone; Southwestern Illinois.

Pentremites pulchellus ULRICH, WELLER.

1920, Illinois State Geological Survey, Bulletin 41, pp. 316-317, pl. 4, figs. 14, 28-30.

Fredonia limestone, Shetlerville formation; Princeton, Kentucky, Rosiclaire, Fairview Bluff, Illinois.

Pentremites pulchellus ULRICH, BUTTS.

1926, Geological Survey of Alabama, Special Report No. 14, p. 181, pl. 59, fig. 33.

Ste. Genevieve limestone; Huntsville, Alabama.

Pentremites cf. pulchellus ULRICH, MORSE.

1930, Mississippi State Geological Survey, Bulletin 23, pl. 13, figs. 3-6.

Chester, Southward Pond formation; Mouth of Pennywinkle Creek, Alabama.

Pentremites pyramidatus ULRICH.

1905, United States Geological Survey Professional Paper No. 36, p. 64, pl. 7, figs. 12-14.

Birdsville formation; Western Kentucky.

Pentremites pyramidatus ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 99, pl. 24, figs. 1-2.

Glen Dean; Cloverport, Breckenrdige County, Kentucky.

Pentremites pyramidatus ULRICH, WELLER.

1920, Illinois State Geological Survey, Bulletin 41, pp. 325-326, pl. 4, figs. 21-24.

Paint Creek formation; Monroe and Johnson Counties, Illinois.

Pentremites pyramidatus ULRICH, BUTTS.

1926, Alabama Geological Survey, Special Report No. 14, p. 198, pl. 65, fig. 1.

Bangor limestone, Glen Dean horizon; Paint Rock River, Marshall County, Alabama.

Pentremites pyriformis SAY.

1825, Journal, Philadelphia Academy of Natural Sciences, (1), vol. 4, p. 294.

Sub-Carb.; Kentucky.

Pentremites pyriformis SAY.

1825, Zoological Journal, vol. 2, No. 7, p. 314.

Pentremites pyriformis TROOST.

1835, Transactions, Pennsylvania Geological Society, vol. 1, pt. 2, p. 228, pl. 10, fig. 8.

Sub-Carb.; near Sparta, Tennessee; Mount Sano, Alabama; Kentucky.

Pentremites pyriformis SAY, OWEN.

1842, American Journal of Science, vol. 43, p. 20, fig. 3.

Pentremites pyriformis SAY, CHRISTY.

1848, Christy's Letters on Geology, pl. 4, fig. 6.

Carboniferous limestone; Huntsville, Alabama.

Pentremites pyriformis SAY, TROOST.

1850, Proceedings, American Association for the Advancement of Science, vol. 1849 (1850), p. 60.

Pentremites pyriformis SAY, HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, p. 693, pl. 25, fig. 16.

Kaskaskia limestone; Chester, Illinois; Huntsville, Alabama.

Pentremites pyriformis SAY, BILLINGS.

1859, Geological Survey of Canada, Decade 4, p. 20, figs. 5 and 7.

Pentremites pyriformis SAY, SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 385 (1866).

Pentremites pyriformis SAY, SAFFORD.

1869, Geology of Tennessee, p. 359, text fig. 1.

Chester group; Cowan and other localities, Tennessee.

Pentremites pyriformis SAY, BILLINGS.

1870, American Journal of Science, vol. 50, p. 228.

Pentremites pyriformis SAY, WACHSMUTH and SPRINGER.

1879, Proceedings, Academy of Natural Sciences, Philadelphia, pl. 17, fig. 5.

Pentremites pyriformis SAY, WHITE.

1881, Second Annual Report, Department of Statistics and Geology of Indiana, p. 511, pl. 7, fig. 9.

Chester group; Down Hill, Crawford County, Indiana.

Pentremites pyriformis SAY, KEYES.

1894, Missouri Geological Survey Paleontology, vol. 4, pp. 135-136 (no figs.)

Kaskaskia limestone; St. Marys, Missouri.

Pentremites pyriformis SAY, HARRIS.

1896, Bulletins of American Paleontology, vol. 1, No. 5, A Reprint of the Paleontological Writings of Thomas Say, p. (82), 352.

Sub. Carb.; Kentucky.

Pentremites pyriformis SAY, ROWLEY.

1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, p. 97, pl. 30, figs. 37-38, 40-45.

Kaskaskia limestone; Warren and Crittenden Counties, Kentucky; Newman's Ridge, Tennessee.

Pentremites pyriformis SAY, ROWLEY.

1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, p. 89, pl. 29, figs. 21-23.

Kaskaskia limestone; Bowling Green, Kentucky.

Pentremites pyriformis SAY, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 38, pl. 3, figs. 8, 9, 15, 16.

Pentremites pyriformis SAY, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 120, pl. 36, figs. 16-17.

Kaskaskia; Bowling Green, Kentucky.

Pentremites pyriformis SAY, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 126, pl. 36, fig. 15.

Kaskaskia; Wolf Creek, Breckenridge County, Kentucky.

Pentremites pyriformis SAY, WOOD.

1909, Bulletin 64, United States National Museum, E. Wood, pp. 13-14, pl. 2, figs. 13, 14, 15.

Sequatchie Valley, Tennessee; Mount Sano, Alabama; Springfield, Kentucky.

Pentremites pyriformis SAY, ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 257, pl. 6, figs. 1-9.

Gasper limestone; Bowling Green, Kentucky; Mount Seno limestone; Huntsville, Alabama; Renault and Paint Creek; Southern Illinois.

Pentremites pyriformis SAY, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 78, pl. 21, figs. 14-17.

Gasper oolite; Illinois and Kentucky.

Pentremites pyriformis SAY, BUTTS.

1926, Geological Survey of Alabama, Special Report No. 14, p. 180, pl. 59, fig. 11.

Gasper oolite; Huntsville, Alabama.

Pentremites robustus LYON.

1860, Transactions, St. Louis Academy of Science, vol. 1, p. 629, pl. 20, figs. 2 a-c.

Marly shale at top of third limestone of Millestone-grit beds; Grayson County, Kentucky.

Pentremites robustus LYON, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 118, pl. 36, fig. 12.

Kaskaskia; Newman's Ridge, Tennessee.

Pentremites reinwardtii TROOST.

1835, Transactions, Pennsylvania Geological Society, vol. 1, p. 224, pl. 10, figs. 10-11.

Silurian; Tennessee.

Pentremites reinwardtii TROOST.

1841, Fifth and Sixth Reports, Geology of Tennessee, pp. 58 and 14.

Silurian, Tennessee.

Pentremites reinwardtii YANDELL and SHUMARD.

1847, Contributions to the Geology of Kentucky, p. 6.

Silurian, Tennessee.

Pentremites reinwardtii YANDELL.

1851, Proceedings, American Association for the Advancement of Science, p. 232.

Pentremites roemeri SHUMARD.

1855, The 1st and 2nd Annual Reports of the Missouri Geological Survey, by G. C. Swallow, Jefferson City, pp. 186-187, pl. B, figs. 2 a, b, c, d.

Chemung group; Providence, Boone County, Missouri.

Pentremites rusticus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, pp. 54-55, text fig. 15.

Chester limestone; Washington County, Arkansas.

Pentremites rusticus HAMBACH, MATHER.

1916, Bulletin of the Scientific Laboratories of Denison University, vol. 18, 1915-1916, pp. 101-102, pl. 3, figs. 3-6.

Hale formation, Brentwood limestone; Fayetteville, Brentwood, Arkansas; Fort Gibson, Gase, Oklahoma.

Pentremites sampsoni HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, pp. 551-552, pl. D, figs. 2-2a.

Chouteau limestone; Pettis County, Missouri.

Pentremites saxiomontanus CLARK.

1917, Bulletin, Museum Comparative Zoology, vol. 61, No. 9, p. 363, pl. 1, figs. 1-6, 14, August, 1917.

Miss. Quadrant formation; Old Baldy, near Virginia City, Montana.

Pentremites sayi SHUMARD.

1855, The 1st and 2nd Annual Reports of the Geological Survey of Missouri, by G. C. Swallow, Jefferson City, pp. 185-186, pl. B, figs. 1 a, b, c, d.

Encrinital limestone; Boone, Marion, Jefferson, St. Louis and Ste. Genevieve Counties, Missouri.

Pentremites serratus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, pp. 56-57, pl. 4, fig. 9.

Chester limestone; Ste. Genevieve, Missouri; Baldwin, Illinois.

Pentremites serrata HAMBACH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 116, pl. 28, figs. 10-11.

Close and Buffalo Wallow formations; Tar Springs, Cloverport, Kentucky.

Pentremites sirius WHITE.

1862, Proceedings, Boston Society of Natural History, vol. 9, p. 20, fig. 3.

Burlington group; Iowa.

Pentremites spicatus ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 263, pl. 7, figs. 33-35.

Glen Dean limestone; Grayson and Breckenridge Counties, Kentucky; Dover Hill, Illinois.

Pentremites spicatus ULRICH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 100, pl. 24, figs. 3-4.

Glen Dean limestone; Cloverport, Kentucky.

Pentremites spicatus ULRICH, WELLER.

1920, Illinois State Geological Survey Bulletin 41, p. 368, pl. 10, fig. 8.

Upper Okaw limestone; Randolph County, Pope County, Illinois; Crittenden County, Breckenridge County, Kentucky.

Pentremites spinosus HAMBACH.

1886, Transactions, St. Louis Academy of Science, vol. 4, pp. 154-155, pl. B, fig. 1.

Kaskaskia limestone; Chester, Illinois.

Pentremites springeri ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 255, pl. 5, figs. 36-40.

Gasper oolite; New Bethel, Kentucky.

Pentremites stelliformis OWEN and SHUMARD.

1850, Journal, Philadelphia Academy of Natural Science, vol. 2, pt. 1, p. 67, pl. 7, figs. 16 a-b.

Pentremites stelliformis OWEN and SHUMARD.

1852, Report of a Geological Survey of Wisconsin, Iowa and Minnesota by David Dale Owen, Philadelphia, p. 593, pl. V, figs. 16 a-b.

Mississippian, Burlington limestone; Burlington, Iowa.

Pentremites stelliformis OWEN and SHUMARD, WHITE.

1863, Journal, Boston Society of Natural History, vol. 3, No. 4, p. 486.

Pentremites subconoideus MEEK.

1873, Geological Survey of the Territories, 6th Annual Report, F. V. Hayden, p. 471 (not figured).

Carboniferous; divide between Ross Fork and Lincoln Valley, Montana.

Pentremites subconoideus MEEK, CLARK.

1917, Bulletin, Museum of Comparative Zoology, vol. 61, No. 9, p. 370 (mentioned, not figured).

Carboniferous; divide between Ross Fork and Lincoln Valley, Montana.

Pentremites subcylindrica HALL and WHITFIELD.

1875, Ohio Geological Survey, Paleontology, vol. 2, pp. 129-130, pl. B, fig. 13.

Niagara group; Yellow Springs, Ohio.

Pentremites subspinosus HAMBACH.

1880, Transactions, St. Louis Academy of Science, vol. 4, p. 154, pl. B, fig. 1.

Kaskaskia limestone; Chester, Illinois.

Pentremites subtruncatus HALL.

1858, Report of the Geological Survey of Iowa, vol. 1, pt. 2, p. 485, pl. 1, fig. 4.

"Calcareous shale of age of Hamilton group of New York"; New Buffalo, Iowa.

Pentremites sulcatus ROEMER, SHUMARD.

1853, Marcy's Expl. Red River of Louisiana, 1852, p. 200, Washington.

Lower Carboniferous; Washington and Crawford Counties, Arkansas.

Pentremites sulcatus ROEMER, SHUMARD.

1858, Transactions, St. Louis Academy of Science, vol. 1, No. 2, p. 243, 246.

Chester Series; Chester, Illinois.

Pentremites sulcatus ROEMER, LYON and CASSEDAY.

1860, Proceedings, American Academy, vol. 4, p. 298.

Pentremites sulcatus ROEMER, SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, p. 385.

Pentremites sulcatus (ROEMER), KEYES.

1894, Missouri Geological Survey, Paleontology, vol. 4, p. 135, pl. 18, figs. 6 a-b.

Kaskaskia limestone; St. Marys, Missouri.

Pentremites sulcatus ROEMER, HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 39, pl. 6, figs. 1-12.

Pentremites sulcatus ROEMER, ROWLEY.

1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 116, pl. 36, figs. 4-5.

Kaskaskia limestone; Hardin County, Kentucky.

Pentremites sulcatus ROEMER, WOOD.

1909, United States National Museum, Bull. 64, pp. 16-17, pl. 3, figs. 14, 15, 16.

Base of Look-out Mountain, Cherokee County, Tennessee.

Pentremites symmetricus HALL.

1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, p. 694, pl. 25, fig. 14.

Kaskaskia limestone; Kentucky.

Pentremites symmetricus HALL, ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 260, pl. 7, figs. 8-10.

Paint Creek formation; Randolph and Monroe Counties, Illinois.

Pentremites symmetricus HALL, CLARK.

1917, Bulletin, Museum of Comparative Zoology, vol. 61, No. 9, p. 371 (mentioned, not figured).

Carboniferous; Old Baldy, near Virginia City, Montana.

Pentremites symmetricus HALL, WELLER.

1920, Illinois State Geological Survey, Bull. 41, pp. 324-325, pl. 4, figs. 26-27.

Renault and Paint Creek limestones; St. Clair and Monroe Counties, Illinois.

Pentremites tennesseeae TROOST.

1850, Proceedings, American Association for the Advancement of Science, vol. 2, p. 60.

Pentremites truncata CONRAD.

1843, Proceedings, Academy of Natural Science, Philadelphia, p. 334.

Edwardsville, Madison County, Illinois.

Pentremites tulipaeformis HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 52, pl. 4, figs. 10-11.

Chester group; Kaskaskia, Illinois.

Pentremites tulipaeformis HAMBACH, BUTTS.

1917, Kentucky Geological Survey, Mississippian Formations of Western Kentucky, p. 100, pl. 24, figs. 5.

Glen Dean limestone; Cloverport, Kentucky.

Pentremites turbinatus HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 54, pl. 5, fig. 6.

Chester limestone; Evansville, Illinois.

Pentremites tuscumbiae ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 244, pl. 2, figs. 14, 15.

Monte Sano limestone; Tuscambia, Alabama.
Upper Ohara limestone; Carrsville, Kentucky.

Pentremites (Tricoelocrinus) varsouviensis WORTHEN.

1875, Illinois Geological Survey, vol. 6, p. 521, pl. 21, figs. 8, 9.

Warsaw beds; Warsaw and near Columbus, Illinois.

Pentremites verneuili TROOST.

1841, 6th Annual Report Geology State Tennessee, p. 14.

Pentremites verneuilii TROOST, SHUMARD.

1858, Transactions, St. Louis Academy of Science, vol. 1, No. 2, p. 247.

Upper Helderberg; Falls of the Ohio, Charlestown, Indiana; Columbus, Ohio.

Pentremites welleri ULRICH.

1917, Kentucky Geological Survey, Formations of the Chester Series, p. 258, pl. 6, figs. 15-26.

Gasper oolite; Monte Sano, Alabama, and Bowling Green, Kentucky.
Renault and Paint Creek formations; Floraville, Illinois.

Pentremites welleri BUTTS.

1926, Geological Survey of Alabama, Special Report No. 14, p. 180, pl. 59, fig. 1.

Gasper oolite; vicinity of Huntsville, Alabama.

Pentremites welleri or godoni, BUTTS.

1926, Alabama Geological Survey, Special Report No. 14, p. 180, pl. 59, fig. 4.

Gasper oolite; Huntsville, Alabama.

Pentremites whitei HALL.

1862, 15th Report State Cabinet of Natural History, New York, pp. 150-151.

Hamilton group; Western New York.

Pentremites (Troostocrinus) woodmani MEEK and WORTHEN.

1868, Proceedings, Philadelphia Academy of Natural Science, p. 356.

Keokuk group; Salem, Indiana.

Pentremites (Troostocrinus?) woodmani MEEK and WORTHEN
1873, Illinois Geological Survey, vol. 5, p. 506, pl. 16, fig. 4.
Keokuk group; Salem, Indiana.

Pentremites (Troostocrinus?) woodmani MEEK and WORTHEN, MEEK.
1874, American Journal of Science (3), vol. 7, p. 375.

Pentremites wortheni HALL.
1858, Report on the Geological Survey of Iowa, vol. 1, pt. 2, pp. 606-607, pl. 15, fig. 1.
Mississippian Keokuk limestone; Keokuk, Iowa; Nauvoo, Illinois.

Pentremites wortheni? HALL, MEEK and WORTHEN.
1873, Illinois Geological Survey, vol. 5, p. 506, pl. 14, fig. 11.
Keokuk group; Crawfordsville, Indiana.

Pentremites (species undetermined) ROGERS.
1868, Geological Report Pennsylvania, vol. 2, p. 833, fig. 688.

Pentremites sp. SIMONDS.
1888, Arkansas Geological Survey, Annual Report, vol. 4, p. 92, wood cut (P. angustus).

Pentremites sp.? ROWLEY.
1903, Contributions to Indiana Paleontology, vol. 1, pt. 12, p. 119, pl. 36, fig. 13.
Kaskaskia group; Crittenden County, Kentucky.

PENTREMITIDEA

Pentremitidea americana BARRIS.
1886, Proceedings, Davenport Academy of Natural Science, vol. 4, pp. 93-94, pl. 1, fig. 4.
Hamilton group; Thunder Bay, Michigan.

Pentremitidea? approximata ROWLEY.
1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, p. 93, pl. 30, fig. 8.
Upper Devonian; Charlestown, Indiana.

Pentremitidea (?) dubia ROWLEY.
1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, pp. 92-93, pl. 3, figs. 5-7, 11.
Upper Devonian; Charlestown, Indiana.

Pentremitidea filosa WHITEAVES.

1887, Contributions to Canadian Paleontology, vol. 1, p. 104, pl. 14, figs. 1, 1a, 1b.
Hamilton group; Thedford, Ontario.

Pentremitidea filosa WHITEAVES, WELLER.

1898, New York Academy of Science, vol. 11, No. 7, p. 122, pl. 14, fig. 3.
Hamilton group; Milwaukee, Wisconsin.

Pentremitidea filosa WHITEAVES, CLELAND.

1911, Wisconsin Geological and Natural History, Survey, Bulletin No. 21, p. 43, pl. 3, fig. 1.
Hamilton formation; Milwaukee, Wisconsin.

Pentremitidea leda var. magna ROWLEY.

1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, pp. 93-94, pl. 30, figs. 9-10, 32-33.
Upper Devonian; Charlestown, Indiana.

Pentremitidea milwaukeensis WELLER.

1898, New York Academy of Science, vol. 11, No. 7, p. 123, pl. 14, fig. 5.
Hamilton group; Milwaukee, Wisconsin.

Pentremitidea milwaukeensis WELLER, CLELAND.

1911, Wisconsin Geological and Natural History Survey, Bull. No. 21, p. 44, pl. 3, fig. 3.
Hamilton formation; Milwaukee, Wisconsin.

Pentremitidea milwaukeensis TELLER.

1911, Bulletin, Wisconsin Natural History Society, vol. 9, pt. 4, p. 203.

Pentremitidea sp. SLOCOM.

1906, Field Columbian Museum Chicago, Pub. Geol. 113, vol. 2, No. 8, p. 263.
Devonian; New York.

SACCOBLASTUS

Saccoblastus bipyramidalis (HALL), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 43, pl. 4, fig. 6.

Saccoblastus lineatus (SHUMARD), HAMBACH.

1903, Transactions, St. Louis Academy of Science, vol. 13, p. 43, pl. 4, fig. 8.

Saccoblastus meekianus (ETHERIDGE and CARPENTER), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 44.

Saccoblastus obliquatus (ROEMER), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 43, pl. 4, fig. 3.

Saccoblastus woodmani (MEEK and WORTHEN), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 43, pl. 4, fig. 1.

Saccoblastus wortheni (HALL), HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, p. 43, pl. 4, fig. 5.

Saccoblastus ventricosus HAMBACH.
1903, Transactions, St. Louis Academy of Science, vol. 13, pp. 60-61, pl. 4, fig. 7.
Warsaw limestone; Boonville, Missouri.

SCHIZOBLASTUS

Schizoblastus haynesi CLARK.
1917, Bulletin, Museum Comparative Zoology, vol. 61, p. 371, No. 9, pl. 1, figs. 15-20.
Madison limestone; Old Baldy and Squaw Creek, near Virginia City, Montana.

Schizoblastus lotoblastus (WHITE), CLARK.
1917, Bulletin, Museum of Comparative Zoology, vol. 61, No. 9, p. 373 (mentioned, not figured).

Schizoblastus melonoides MEEK and WORTHEN, ETHERIDGE and CARPENTER.
1886, Catalogue of the Blastoidea, p. 226, pl. 6, figs. 15, 16.
Upper Burlington limestone; Burlington, Iowa.

Schizoblastus melonoides (MEEK and WORTHEN), KEYES.
1894, Missouri Geological Survey, Paleontology, vol. 4, p. 138 (not figured).
Upper Burlington limestone; Louisiana, Missouri; Hannibal, Missouri.

Schizoblastus? roemeri (SHUMARD), KEYES.
1894, Missouri Geological Survey, Paleontology, vol. 4, p. 137 (not figured).
Chouteau limestone; Sedalia, Providence, Missouri.

Schizoblastus sayi (SHUMARD), ETHERIDGE and CARPENTER.

1886, Catalogue of the Blastoidea, p. 224, pl. 3, figs. 1-3, pl. 6, fig. 18, pl. 10, fig. 17, pl. 17, fig. 1.

Upper Burlington limestone; Burlington, Iowa.

Schizoblastus sayi (SHUMARD), KEYES.

1894, Missouri Geological Survey, Paleontology, vol. 4, p. 138, pl. 18, figs. 9 a-b.

Burlington limestone; Ash Grove, Louisiana, Hannibal, Missouri; Palmyra, Ste. Genevieve, Missouri.

Schizoblastus sayi (SHUMARD), ROWLEY.

1905, American Geologist, vol. 35, p. 302, pl. 21, fig. 4.

Upper Burlington limestone; Louisiana, Pike County, Missouri.

TRICOELOCRINUS

Tricoelocrinus meekianus ETHERIDGE and CARPENTER.

1886, Catalogue of Blastoidea, p. 208, pl. 16, figs. 17, 18.

St. Louis group; Spergen Hill, Indiana.

Tricoelocrinus meekianus E. and C., BEEDE.

1906, Indiana Department of Geology and Natural Resources, 30th Annual Report (1905) 1906, pp. 1266-1267, pl. 14, figs. 7 a-b.

Salem limestone; Spergen Hill, Paynters Hill, Bedford, Bloomington, Indiana.

Tricoelocrinus obliquatus (ROEMER), ETHERIDGE and CARPENTER.

1886, Catalogue of the Blastoidea, p. 206, pl. 18, figs. 10-13.

St. Louis limestone; Washington, Indiana.

Tricoelocrinus woodmani (MEEK and WORTHEN), ROWLEY.

1902, Contributions to Indiana Paleontology, vol. 1, pt. 10, pp. 90-91, pl. 29, figs. 35-36, 42-43.

Warsaw formation; Bridgeport, Harrison County, Indiana.

Tricoelocrinus woodmani (MEEK and WORTHEN), ROWLEY.

1904, Contributions to Indiana Paleontology, vol. 1, pt. 19, pp. 189-190, pl. 57, figs. 5-8.

Warsaw limestone; Greenville, Indiana.

Tricoelocrinus woodmani (MEEK and WORTHEN), BEEDE.

1906, Indiana Department of Geology and Natural Resources, 30th Annual Report (1905) 1906, pp. 1267-1268, text figures 4-5.

Harrodsburg limestone; Salem, Indiana.

TROOSTOCRINUS

Troostocrinus? dubius ROWLEY.

1900, American Geologist, vol. 25, p. 70, pl. 2, figs. 36, 37, 38.

Lower Devonian, Bailey formation; 1½ miles below Wittenburg, Perry County, Missouri.

Troostocrinus? dubius ROWLEY.

1904, American Geologist, vol. 34, pp. 274-275, pl. 16, figs. 28, 29.

Lower Devonian, Bailey formation; 1½ miles below Wittenburg, Perry County, Missouri.

Troostocrinus nitidulus MILLER and GURLEY.

1890, Indiana Geological Survey, 16th Annual Report, p. 373, pl. 9, figs. 14, 15, pl. 10, fig. 14.

St. Louis group; Lanesville, Indiana.

Troostocrinus reinwardtii SHUMARD.

1865, Transactions, St. Louis Academy of Science, vol. 2, No. 2, pp. 384-385.

Troostocrinus reinwardti (TROOST), SHUMARD.

1866, Transactions, St. Louis Academy of Science, vol. 2, p. 384.

Troostocrinus reinwardti (WOOD).

1909, United States National Museum Bulletin 64, pp. 17-18, pl. 3, figs. 2, 3, 4.

Decatur County, Tennessee.

Troostocrinus reinwardti SPRINGER.

1926, Smithsonian Institution, Pub. No. 2871, p. 141, pl. 33, figs. 1-8.

Beech River formation, Niagaran; Decatur, Wayne, Perry Counties, Tennessee.

Troostocrinus reinwardti minimus FOERSTE.

1920, The Ohio Journal of Science, vol. 21, p. 64, pl. 1, fig. 14.

Bainbridge formation; 6 miles west of St. Marys, Ste. Genevieve County, Missouri.

Troostocrinus sanctipaulensis FOERSTE.

1920, Ohio Journal of Science, vol. 21, p. 64, pl. 1, fig. 16.

Laurel limestone; St. Paul, Indiana.

Troostocrinus sanctipaulensis SPRINGER.

1926, Smithsonian Institution, Pub. No. 2871, p. 141, pl. 33, fig. 9.

Laurel limestone, Niagaran; St. Paul, Indiana.

Troostocrinus subcylindricus (HALL and WHITFIELD), FOERSTE.

1920, The Ohio Journal of Science, vol. 21, p. 65, pl. 3, figs. 3 a-c.
Cedarville dolomite; Yellow Springs and Cedarville, Ohio.

Troostocrinus sp. FOERSTE.

1920, The Ohio Journal of Science, vol. 21, p. 66, pl. 1, fig. 15.
Racine dolomite; Bridgeport, Illinois.

Troostocrinus wachsmuthi GURLEY.

1884, New Carboniferous Fossils, Bull. No. 2, p. 1.
Warsaw Division; Ellettsville, and Spergen Hill, Indiana.

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AN ANNOTATED LIST OF THE AMPHIBIANS AND REPTILES OF JEFFERSON COUNTY, MISSOURI

By

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and
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By DOROTHY A. BOYER and ALBERT A. HEINZE

Kimmswick, Mo.

The following notes on the herpetology of Jefferson County, Missouri, are offered as the first of a series of papers on the subject from this county. Jefferson County was selected for this study first, because of its accessibility from St. Louis City and its popularity with the summer tourists from that city; second, because it was the home of one of the authors for many years and is therefore familiar; and third, because of its interesting geological situation and contours. Located as it is, in the foothills of the Ozarks, it includes many hills and wide valleys within its boundaries, which are formed by the Mississippi on the East, and partially by the Meramec River on the North, by Big River on the West, and by Isle Du Bois Creek on the South. This county is amply supplied with those agencies which contribute to the dissemination and distribution of water inhabiting animals. Sandstone and limestone bluffs furnish the necessary retreats or dens for certain species. Although much of the woodland has been cleared, much has escaped the ax, with the result that there is still ample forest that is suitable to such species as require the sylvan habitat.

Because of the individual preferences of the authors it has been possible to divide this work most satisfactorily, the junior author having prepared the papers on the amphibians, and the senior author having been responsible for the reptile notes.

The writers wish to take this opportunity to extend their special thanks to Dr. Charles E. Burt of Southwestern College, Winfield, Kansas, for his courtesy in reviewing the present paper. They wish also to acknowledge the kindly aid rendered by the following: Drs. E. R. Dunn, A. H. Wright, Frank N. Blanchard, E. H. Taylor, and Mr. Norman Hartweg in the determination of specimens; to Messrs. Roger Conant, R. Marlin Perkins, and Harold I. O'Byrne for timely advice and helpful criticisms, and to Mr. Leslie Hubricht for valuable aid in the collection of the material which has made the present paper possible.

LIST OF SPECIES

AMPHIBIA

Necturus maculosus (RAFINESQUE)—The mud puppy is sometimes taken on fishing lines in the Meramec and Big Rivers.

Cryptobranchus alleganiensis (DAUDIN)—Hellbenders are occasionally taken on trot lines in the rivers.

Triturus viridescens viridescens (RAFINESQUE)—The common newt has been found in the permanent, shallow bodies of water at Pevely, Danby, and Pacific. Captive specimens have deposited eggs during the period of March 2-28. Females were observed laying eggs in *Vallisneria sp.* while they lay suspended with the grass immediately behind the hind limbs (both of which were thrust stiffly backward), the tail being curved anteriorly under the body, which process resulted in the folding of the grass. Simultaneously an egg or two was placed within the fold—which remained adherent in this position. A series of twenty-seven larvae collected on June 5, 1932, had a maximum length of 51 mm., a minimum length of 30.7, and an average length of 37.77.

Ambystoma maculatum (SHAW)—The spotted salamander, which occurs mostly in the vicinity of upland ponds, is common only locally. Our specimens, taken at Danby, were collected during the brief breeding season during the latter part of February and early March. The eggs are deposited in spherical, glairy masses which are often pierced by leaves or twigs. After leaving the eggs in either floating or submerged positions, the salamanders seek shelter beneath logs and rocks a few feet from the edge of the water. This species, like the others of the genus, leads a nocturnal, burrowing life.

Ambystoma opacum (GRAVENHORST)—The marbled salamander is rather rarely taken. It usually inhabits, with *A. maculatum*, the upland ponds. Specimens have been taken at Danby.

Ambystoma texanum (MATTHES)—The small-mouthed salamander is of moderate occurence near sloughs, ponds, and temporary pools in low areas, specimens have been taken at Kimmswick and near Danby. The adults are perhaps the least attractive salamanders occuring in Jefferson County. The eggs of this species, which have been collected between February 28 and March 24, 1932, are different from those of *A. maculatum* in that the complement is a loose, filmy packet. Specimens have been taken at Kimmswick as early as February 28.

Ambystoma tigrinum (GREEN)—Tiger salamanders, although well distributed in Jefferson County, are not commonly taken. They may occasionally be found sharing the same cover with both *A. maculatum* in the uplands and *A. texanum* in the lowlands. Adults are occasionally unearthed in plowing. Due to its habit of wandering and falling into pits around dwellings, this is perhaps our best known salamander. We have collected them at Kimmswick, Danby, Sulphur Springs, near Barnhart and Pevely.

Plethodon cinereus (GREEN)—From point of numbers the red-backed salamander is perhaps the most common in this county, although its range here seems to be confined principally to the narrow belt of St. Peter's sandstone. The species is most frequently found in wet leaves and under moist rocks beside springs and seepage water in northern exposures. A series of ten large specimens show a total length varying from 64 to 99 mm. Three have injured tails which are partially regenerated. These average 68.4 mm. in length, with an average of 2.73 mm. for the regenerated tip. The seven perfect specimens have an average total length of 85.12 mm. These are the smallest salamanders occurring in this county. Large numbers can be found near Festus and specimens have been taken near Kimmswick and Goldman where they are fairly abundant.

Plethodon glutinosus (GREEN)—The slimy salamander is moderately common and we have taken it at Goldman, Kimmswick, Danby, Festus, Barnhart, and Antonio. It occurs most frequently at the base of rocky glades and wooded, rocky hillsides in fairly moist soil with southern exposure. In the summer months it is often found with the preceding species and it has been observed in caves. Specimens taken at Goldman in November, 1930, prior to the winter hibernation, were observed to have greatly swollen tails. In captivity they consistently refused food over a period of several months, after which time a reduction in the size of the tails was quite obvious. This swelling is not noted in specimens taken in the spring and summer months and it seems logical to assume that the tails are utilized as storehouses for food needed during the period of hibernation. They seem to have little resistance when subjected to extremely wet conditions. One specimen, washed in a cold spring stream, died a few hours later; the temperature of the water may have been a contributing factor in the death. Another instance resulted in a similar fate: two specimens confined with young *Ambystoma texanum* were sheltered beneath a piece of moss which was moistened to a state of sogginess. Upon investigation later it was found that the slimy salamanders were drowned, while the *Ambystoma* young seemed to have suffered no ill effects.

Eurycea longicauda (GREEN)—The long-tailed salamander is locally common in shaded locations beneath rocks and logs in and

closely adjacent to spring streams and seepage water where it is most frequently found. It also has been taken in wet leaves in the spring at Goldman, Barnhart, Festus, and Pevely. Its habits are much like those of the following species:

Eurycea lucifuga RAFINESQUE—The spotted tail or hoosier salamander is not common. Specimens have been taken at Goldman, Pevely, Barnhart, and Festus. It is usually found in or closely associated with caves and springs. During the rainy periods in the spring it may occasionally occur beneath limestone slabs on glades and wooded hillsides but it is usually present in the vicinity of the springs to which it repairs when surrounding areas become too dry. Once, in late spring, a specimen was observed in the open, clinging to a ledge above a crevice from which a spring flowed. As it was approached it leaped down and scurried into the aperture. It is likely that a cave occurs under the hill but no specimens other than a larva taken August 7, 1932, with the gills in an atrophied state (and with a total length of 46 mm., and tail length 21mm.) were to be found at this place, near Barnhart, during the summer. At this time, it is believed, they enter caves; at least they occur in cave retreats more frequently than any of the other species that inhabit this region. Two adults taken from this same habitat on March 26, 1932, have the following measurements: total length, 151 and 105 mm., and tail, 78 and 61, respectively.

Siren lacertina LINNÉ—Specimens are occasionally taken in the Meramec and Big Rivers.

Bufo americanus HOLBROOK—The American toad is common in Jefferson County where it has been taken at the following localities: Danby, Pacific, Kimmswick, Sulphur Springs, Isle Du Bois Creek, Barnhart, and Hollywood Beach. It requires warmer evenings than do the frogs to arouse it from hibernation to enchant the spring nights with its high-pitched, shrill calls. On the evening of June 19, 1932, a transformation from the larval state was observed, near Pacific, when thousands of tiny toads became active in the vicinity of river sloughs where their small moving bodies seemed to imbue the gravel with life. By July 9 comparatively few of these young amphibians were seen here and comparisons of collections revealed a larger size average. A series of larvae and adults was also taken at this time. On the evening of August 6 a baffling call was heard from the vicinity of several large pools; it was a high-pitched, rasping sound with little carrying power and of short duration, and although it had most of the qualities of the call of the toad, it was not readily associated with the species. Investigation of the vicinity revealed the singers to be young specimens about an inch in length.

Bufo fowleri GARMAN—Fowler's toad is rather abundant and has been collected at Sulphur Springs, Pacific, Glaize Creek, Kimmswick, Barnhart, Hollywood Beach, and Big River Heights. Its habits and characteristics differ little from the preceding species.

Acris gryllus (LE CONTE)—The cricket frog is the most common frog in this county where it has been collected at Isle Du Bois Creek, Danby, Kimmswick, Barnhart, Antonio, Sulphur Springs, Festus, Pacific, Sunnyside, and Maxville. It is generally abundant wherever permanent waters are to be found, where it may be taken as early as the middle of February and as late as mid-November. On July 17, 1932, metamorphosis was occurring in these frogs at Isle Du Bois Creek where, it was estimated, many thousands of these small frogs occurred, and where specimenes in almost all stages of development were present. Some juveniles without fully absorbed tails had bright green dorsal patterns while tailed specimens approaching transformation possessed the typical triangular dorsal marking, but no such larvae were observed to have the black tail tip characteristic of the tadpoles occurring in a woodland pond at Danby, about two miles distant. A transforming specimen upon emergence from the water on August 9 possessed a body length of 14.4 mm., tail, 14.9. Two hours and forty minutes later the tail measurement was 10.75, an absorption of 4.15 during this period. Another larva, measured at 9:15 P. M., had a body length of 15.1, tail, 31.7, of which 9 mm. possessed dark pigmentation; the mouth was transformed, the dorsal pattern distinct. By 7:30 P. M. August 10 the body length was 14.4, tail, 24, dark tip, 3.5, and by 2 P. M. August 11 the body length was 14, tail, 1.5. In this period of 40¾ hours the reduction in body length was 1.1 mm., tail, 30.2. By September 18 the transformation period was nearing its end and few larvae could be taken by seining at this time. On this date, however, a ribbon snake, *Thamnophis sauritus proximus*, was lying on a mat of aquatic vegetation at a pond near Danby, and when captured it disgorged three cricket frogs, one a transforming specimen.

Pseudacris triseriata triseriata (WIED)—The three-striped tree frog usually inhabits low, swampy areas and is generally abundant where found. Specimens have been taken at Kimmswick, Imperial, Sulphur Springs, Barnhart, various places in Rock Creek, Glaize Creek and the Meramec River, and near Danby. When the males are singing in the spring their inflated, yellowish-grey throats bear a remarkable resemblance to floating fruits of the horse nettle, *Solanum carolinense*. When disturbed, the frogs swim below the surface and usually emerge amid a clump of grass or debris. Many seem quite fearless and continue to sing when a hand is little over twelve inches distant; for when intent upon their songs they prac-

tically have to be touched to become alarmed. Snakes must find these little creatures easy prey at such times. A collection of adults that were taken on April 23, 1932, were clasped in pairs, and the females deposited eggs on April 25. On cool, rainy days captive individuals remain concealed under leaves in water in their cages. On the evening of August 6 this species was heard singing in a pool in an abandoned stone quarry near the Meramec River.

Hyla crucifera WIED—While not commonly found, the spring peeper occurs in large numbers in some localities during the breeding season in February and March. They have been taken at Danby, Imperial, Sulphur Springs, Goldman, and Barnhart. These ardent little singers are little daunted by the presence of human beings and most specimens will give their shrill calls even during transportation in collecting pails. Males were greatly in the majority of specimens taken by seining drifted leaves from a woodland pond, near Danby, on February 28, 1932. On March 20 three clasping pairs were seen and they continued in amplexus for some time in captivity. During the night of March 21-22 many eggs were deposited in the water, where they were observed clinging singly to the under surfaces of submerged oak leaves or lying on the bottom of the container. Tadpoles introduced into a container with some *Ambystoma* larvae on August 8 were later found with only parts of the tails protruding from the salamanders' mouths. In nature carnivorous salamanders are probably a serious menace to the tadpoles. One tadpole that was rescued from a salamander had a body length of 16.5 mm.; tail, 27.8; posterior legs, 20; greatest body depth, 7.1; greatest width, at anterior leg bulges, 8.5; tail depth, 8.2; thickness, 2.9. Some other features were: Dorsum olive drab; rostrum, flesh pink diffused with olive; digits, dark olive; latero-ventral areas, pearly iridescent, semi-transparent, revealing viscera; ventral surface opaque creamy white; mouthparts, black; iris, two golden rings separated by one of medium grey; anterior tail dilation orange yellow, darkening to deep orange posteriorly; black tail blotches confluent with black tail margin. One tadpole emerged from the water with a total length of 33 mm., and transformed at 16.8. An adult was found on October 9, near Goldman, on moist fallen leaves beneath a sandstone ledge where its protective coloration was remarkable and this gave rise to the assumption that this might account for the infrequence of the discovery of specimens during the summer and fall months.

Hyla versicolor versicolor (LE CONTE)—Although Hurter (1911)* listed the tree toad from Jefferson County, we have not, as yet, been fortunate enough to take it here. It is moderately rare about water in the spring, becoming arboreal in the summer.

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*Hurter, J., Sr. 1911. Herpetology of Missouri. Trans. Acad. Sci. St. Louis. 20: 59-274, pls. 18-24.

Rana catesbeiana SHAW—The bullfrog is not common and is always associated with water. Specimens have been collected at Pacific, Fletcher, and Glaize Creek near Barnhart. Several stomachs examined contained crayfish and one revealed the remains of a mouse.

Rana clamitans LATREILLE—The green frog is most frequently found in backwaters or isolated pools into which an abundance of leaves have fallen. They have been taken at Danby, Wolf Hollow Spring, Moss Hollow Spring, and Isle Du Bois Creek. The species seldom ventures far from the water and examples are often found crouching beneath some shelter during the day. A water snake, *Natrix sipedon sipedon*, disgorged a young green frog at capture; and another green frog was found dead under a rock where a crayfish had been feeding upon it. It is possible that the crustacean killed the frog. A collection made July 24, 1932, showed an equal representation of both sexes.

Rana palustris LE CONTE—The pickerel frog is rare in this county. A few specimens have been taken at Moss Hollow Spring. Elsewhere in Missouri they have been taken most frequently in caves, while a few have been found near cold spring creeks; a native farmer once called this the brush frog because it seeks shelter in thickets when alarmed.

Rana pipiens SCHREBER—The leopard frog is common almost any place where water is to be found. We have taken them at Danby, Kimmswick, Isle Du Bois Creek, Barnhart, Glaize Creek, Sulphur Springs, Moss Hollow, Goldman, Imperial, and Festus. Adults were taken on February 27 near Kimmswick where one nearly mature individual was found on August 5, 1932, in a small excavation about four inches high and six to eight inches long, where it was exposed to the direct rays of the hot sun in a hillside strawberry patch about 500 feet from the nearest water. The animal, crouched in the steamy, hot location when discovered, and hopped into the weeds when disturbed. The only explanation of its presence in so unfavorable a location was that of the abundance of insect life here at night.

REPTILIA

Crotaphytus collaris (SAY)—Although not common in most habitats, collared lizards are fairly abundant in the dry, rocky, glade country. They have been collected at Goldman, Hillsboro, Crystal City, DeSoto and near Big River Heights, and the writers have introduced them to a glade near Kimmswick. One large male specimen, captured near Kimmswick on August 4, 1932, performed

a very interesting dance for his captor before he was taken. After having been pursued across two wide boards in a scrap pile, the lizard was allowed to halt while his pursuer knelt opposite him and talked in soothing tones. The lizard's first reaction was to inflate himself to the full extent of his ability in an attempt to create a formidable appearance, then, stiffly bracing his body, he opened his mouth threateningly. When slowly approached he reared high, somewhat arching his back, and while balancing himself on his heels began simultaneously to raise all his toes into the air and pat them on the board in jerky movements. This performance was continued until he had been approached to within 30 inches, when he began to sway his body violently from side to side while standing with all feet firmly planted. After about 15 such jerky movements he flashed out of sight beneath a board, where he was captured. In captivity he exhibited a viciousness characteristic of the species. Hysterical attempts to flee when approached and a beautiful, courageous defense are also typical. Just before he was liberated this specimen leaped a distance judged to be about 20 inches into the air at the photographer's fingers. (See Figs. 1 and 2.) Few captive specimens have evinced an interest in food, most frequently preferring to starve to death; however, one specimen killed a small *Sceloporus undulatus undulatus* and another a *Cnemidophorus sexlineatus sexlineatus*, neither of which was eaten.

Sceloporus undulatus undulatus (LATREILLE)—The fence lizard is the most common lizard in Jefferson County and is abundant everywhere; here specimens have been collected at Festus, Goldman, Hillsboro, Kimmswick, Barnhart, Danby, Sulphur Springs, Glen Park, Riverside, Bushburg, Antonio, Montebello, Beck, Pevely, DeSoto, Fletcher, Big River Heights, Pacific, and House Springs. This species is apparently able to endure much lower temperatures than other lizards occurring here and can be found abroad on favorable days from February 10 to November 15. It has a dance which it employs during the mating season and at other times of emotional disturbances, such as contemplation of food when hungry, exhibitions of fear or anger when approached, contemplation of another lizard or a snake. The performance consists of a quick bobbing up and down of the body while the elbows are held rather rigidly out from the body. Most insects of suitable size seem acceptable as food in captivity.

Ophisaurus ventralis (LINNÉ)—The joint snake or glass snake is moderately common in Jefferson County, seeming to prefer worn-out meadows and abandoned fields, probably because of the greater ease in burrowing here. All our specimens have been collected at Kimmswick, Sunnyside, and Sulphur Springs in eastern exposures,

in habitats where water is easily accessible, although the burrows themselves were in fairly dry soil. They have been noted, in early spring, to come to the surface to sun themselves near their burrows, into which they quickly retreat if disturbed; but as the days grow warmer they are to be found only in the cooler hours of the morning or evening foraging abroad, spending the warmest portions of the day in their burrows even though they are apparently able to withstand much heat. If it is not raining, captive specimens will come to the surface on rainy days, but if it is rainy or misty they seem to prefer to remain in their subterranean retreats, even though their cages be indoors. Often quarrelsome attitudes are exhibited and in such cases the victim is invariably seized at the base of the jaws. Cannibalism has not been noted, however. In spring and early summer earthworms are an acceptable article of diet, but as the season progresses these are scorned if grasshoppers are available. Other insects are taken but orthopterons seem to be preferred. These are very intelligent reptiles for the most part and can be taught to acquire very distinct habits, such as coming to the surface at a certain hour each day for food. Water is taken in by means of the tongue in much the same manner that a cat laps liquid, only more slowly. Natives of this county consider these lizards deadly.

Cnemidophorus sexlineatus sexlineatus (Linné)—These lizards are abundant in the dry, open woods and glades, where their burrows seem to be a network of runways. They have been taken at Goldman, Danby, Barnhart, Antonio, Hillsboro, Kimmswick, and Glen Park. Specimens about farmhouses become very tame and can be approached to within a foot or two, which seems worthy of note in a species which is naturally extremely timid in the wild. Three specimens taken at Glen Park on June 14, 1931, were not examined again until June 18 when five eggs were found and one female was observed to be pregnant. During the night of June 20-21 this specimen laid six eggs in damp sand; their dimensions were: five, 16x10 mm., one, 15x10. No lessened activity has been noted in gravid females. Another specimen taken near Goldman on June 21 deposited four eggs beneath a rock in its cage during the night of June 23-24, all of which measured 9x17 mm. They feed well in captivity on almost any insect of suitable size. One specimen disgorged a lepidopterous larva of the cutworm group at capture and another specimen of this lover of dry, sandy places was found foraging at the edge of the water of a pond near Danby. When driven into grasses they are at a decided disadvantage and may be taken readily.

Leiolopisma laterale (Say)—The ground lizard is abundant during the summer months in the fallen leaves, it being possible, by moving quietly, to see as many as a dozen and a half during

the course of an evening stroll through the woods. Specimens have been collected at Kimmswick, Goldman, Barnhart, Pevely, Danby, Hillsboro, Festus, and near High Ridge. They have never been observed to take food in captivity and fall easy prey to the larger, cannibalistic lizards when confined with them. One large *Sceloporus magister* accounted for about four of these little creatures before it was discovered that he was the cause of their mysterious disappearance. They are generally overlooked because of their concealing coloration.

Eumeces anthracinus (BAIRD)—The coal skink is rarely taken but it is probably more common than is generally believed, its retiring habits and protective coloration adequately concealing it.

Eumeces fasciatus (LINNÉ)—The blue-tailed skink is common everywhere but is often overlooked, due to its protective coloration. Specimens become very tame about dwellings and will often venture inside houses without fear. In captivity they feed readily, some individuals exhibiting somewhat of a preference for beetles. When pursued they do not hesitate to take to the water and are very agile swimmers over short distances, at least. Often the scratching noise of their tiny feet can be heard on the leaves in the woods.

Carphophis amoena vermis (KENNICOTT)—Worm snakes are moderately rare in collections from Jefferson County, perhaps due to the fact that they lead a subterranean life under rocks on shaded slopes. We have taken them at Festus, Big River Heights, Hematite, and Kimmswick. One individual taken near Festus was found under a nearly submerged rock in a very wet location where it had evidently been washed by the heavy rains of the preceding night.

Diadophis punctatus arnyi (KENNICOTT)—Ringneck snakes are moderately rare though generally common where found, under rocks on shaded slopes. We have taken them at Festus, Big River Heights, Goldman, and Kimmswick. A few have been found wandering a short distance from cover, but not many. One specimen was seen heading for the water at Moss Hollow Spring and when efforts were made to capture it, it swam readily. Captives burrow during the day and become active at night, often climbing on plants in the cages.

Heterodon contortrix (LINNÉ)—The spreading adder is rare in this county where it has been taken at Imperial, Barnhart, Antonio, and on State Highway 25 near Isle Du Bois Creek. It is found in the lowlands, frequenting rocky creek beds and the vicinity of running water. One female disgorged a live *Bufo americanus*

when first captured and when killed and dissected on July 20 it was found to contain 12 eggs.

Opheodrys aestivus (LINNÉ)—Rough green snakes are common here in the low branches of cedars and shrubs in the shaded locations where they are generally overlooked because of their remarkable concealing coloration. Specimens have been taken at Kimmswick, Barnhart, Sulphur Springs, Danby, Imperial, and Sunnyside. Occasional examples are seen near the water, apparently having gone there to drink. They evidence little fear of man in the wild and will lie quietly in bush or tree, relying entirely on their coloring for concealment. One individual drank much water after it was force fed on sow bugs but made no attempt to regurgitate the crustaceans.

Coluber constrictor constrictor (LINNÉ)—The black racer is the most common snake in Jefferson County where it has been taken at Danby, DeSoto, Festus, Hematite, Hillsboro, Antonio, House Springs, Seckman, Goldman, Kimmswick, Barnhart, Imperial, Sulphur Springs, Sunnyside, Beck, Maxville, High Ridge, and Glen Park. Specimens which would otherwise have been passed unnoticed in the woods have sometimes been detected by their odor. Often these racers are caught and held fast by the oil-tar mixture when crossing our gravel roads and many such unfortunate snakes have been taken by us. One large adult, seen on a glade near Kimmswick with two large copperheads in November, 1931, was taken at the same place and in the same company the following April. It was bitten very severely by both copperheads but, other than a righteous indignation, showed no ill effects. Another instance of this species seeking shelter with the copperhead was the collection of a large black racer with a copperhead on a glade near Kimmswick in April, 1933. Two copulating pairs were taken on May 3, 1931.

Masticophis flagellum flagellum (SHAW)—Coachwhip snakes are rare in this county but have been taken in dry, rocky situations, one having been found in McLoon's Quarry near Barnhart and another near Danby on Highway 25. Captives have fed well on mice and one specimen took a young *Elaphe laeta* in its cage, while another ate an adult *Cnemidophorus sexlineatus sexlineatus*.

Elaphe laeta (BAIRD and GIRARD)—These moderately rare chicken snakes are taken most frequently about human habitations, in cellars and farmhouses where they are known to feed voraciously on mice; because of their frequent appearance about dwellings they have earned the name of house snake locally. Specimens have been taken at Antonio, House Springs, Barnhart, Kimmswick, DeSoto, Sulphur Springs, Imperial, Beck, Festus, and Maxville.

Elaphe obsoleta obsoleta (SAY)—Though rather rare, the pilot blacksnake is found in most habitats and, like the preceding species, is often found about dwellings where rodents can be had. They have been collected at House Springs, Kimmswick, Sulphur Springs, Imperial, Goldman, Antonio, Barnhart, DeSoto, and Fletcher. One example, taken near Hillsboro on May 22, 1932, had eggs plainly visible in the body and between 10 P. M. on that date and 7:30 A. M. May 23 had deposited 16. Their measurements varied from 32.5x26.5 mm. to 29x25, average 30.78x25.12. Most of our specimens have been gentle captives and easily force fed.

Lampropeltis calligaster (HARLAN)—The prairie king snake, found in the upland meadow country, is moderately rare in this county where it has been taken at Antonio, Kimmswick, Barnhart, Danby, Festus, DeSoto, Imperial, Beck and Pevely. It is most frequently taken where mice are to be found, in fields, haystacks, or about corncribs. One individual, placed in a collecting sack at capture, was found to have eliminated the remains of a bird and, although digestion had rendered the species unrecognizable, there was ample evidence in the undigested feathers to give rise to the belief that this was a sparrow, probably a field sparrow.

Lampropeltis getulus holbrooki (STEJNEGER)—Speckled king snakes are moderately common everywhere but are principally taken in the open situations. They have been collected at Goldman, Kimmswick, Imperial, Barnhart, and Sunnyside. One vicious specimen would eat any species of snake smaller than itself that was placed in its cage and on one occasion it killed a *Lampropeltis calligaster* larger than itself but made no attempt to eat its victim. Dead sparrows or mice placed within its jaws were always eaten but beef was consistently rejected. Most examples in captivity are fond of live mice. A female taken near Kimmswick on June 29, 1931, laid 14 eggs on July 1.

Lampropeltis triangulum syspila (COPE)—The milk snake is considered rare in Jefferson County where it has been taken at Barnhart, Glen Park, Sulphur Springs, Kimmswick, and Hillsboro. It is erratic of occurrence and has been taken by us here only on rocky, shaded slopes, generally under lime flakes. Captives can be satisfactorily force fed.

Natrix grahamii (BAIRD and GIRARD)—Graham's water snake is usually found about bodies of water where an abundance of fish may be had. Specimens have been taken in Plum Creek near U. S. Highway 61.

Natrix rhombifera (HALLOWELL)—Diamond back water snakes are always found closely associated with water. They have been taken in Plum and Isle Du Bois Creeks.

Natrix sipedon sipedon (LINNÉ)—These water snakes are moderately common locally about bodies of water and are called water moccasins by the natives. They have been taken in Mud Creek, Barnhart, Moss Hollow, Sulphur Springs, Isle Du Bois Creek, Antonio. Where fishermen are common, these reptiles become very fearless and rely successfully upon protective coloration for concealment. One freshly caught specimen took a live minnow from the fingers, swallowing the fish tail first. This specimen, when killed on July 20, was found to contain nine eggs. Freshly captured specimens have disgorged *Rana clamitans*, *R. catesbeiana*, *R. pipiens*, minnows and sunfish.

Storeria dekayi (HOLBROOK)—One adult DeKay's snake was taken about 100 yards from the Meramec River, near Pacific, on June 19, 1932, in the vicinity of a small pool which was teeming with freshly transformed *Bufo americanus*. It was found to be fond of these tiny toads and would accept earthworms readily. Specimens have been taken at Kimmswick and near Pacific. One example was plowed up in a rocky field.

Storeria occipito-maculata (STORER)—The red-bellied snake is rare in this county where it has been taken at Kimmswick and Hematite. Specimens have been secured in shaded, rocky woods, and one adult was found in a rotted stump.

Virginia valeriae elegans (KENNICOTT)—Valeria's snake is rare here. Our specimens have all been taken in the leaves in shaded, rocky woods after rains. One adult was taken near High Ridge.

Potamophis striatulus (LINNÉ)—Hurter (1911) recorded this brown snake from Jefferson County.

Thamnophis lineatus (HALLOWELL)—The lined snake is secretive in habits but is sometimes taken on sidewalks and it often occurs under debris in vacant lots. Specimens have been liberated at Kimmswick.

Thamnophis sauritus proximus (SAY)—Ribbon snakes are moderately rare and are generally found in the vicinity of water. They have been taken at Danby, Kimmswick, and Crystal City. One specimen, captured near Danby, disgorged two adult and one transforming cricket frogs (*Acris gryllus*) at capture. Examples also have been observed to take *Eurycea longicauda* and raw beef of their own volition. All examples seem to have one thing in common at least: as soon as the cage door is opened they make a mad bolt for liberty, which some have attained.

Thamnophis sirtalis sirtalis (LINNÉ)—The common garter-snake is taken principally in locations where frogs and toads abound. Individuals have been secured at Kimmswick where the writers are now introducing numbers of the species. Captive specimens are usually very docile and will readily take *Rana pipiens, R. clamitans, R. catesbeiana, Bufo americanus, Hyla crucifera, Acris gryllus,* besides the very acceptable earthworm. One individual made several nearly successful attempts to swallow a large, dead English sparrow but was finally obliged to desist since the bird was too large for its mouth; however, after most of the feathers had been removed, the reptile had little difficulty in swallowing the sparrow. Occasional individuals have learned to follow the hand about the cage in anticipation of food and seemed to revel in being handled.

Tantilla gracilis BAIRD and GIRARD—The graceful tantilla is moderately rare in this county where specimens have been taken at Goldman, Pevely, and Kimmswick. It lives a subterranean life under rocks on shaded hillsides.

Agkistrodon mokasen BEAUVOIS—Copperheads are moderately common on rocky hillsides near streams bounded by cliffs and they are often taken about dwellings, probably attracted to the latter place by the mice. Specimens have been collected at Antonio, Sulphur Springs, Sunnyside, Kimmswick, Festus, Goldman, Barnhart, and Glen Park. As captives they are resentful, treacherous, and often ill tempered, striking without warning. The young have been born in our cages on August 12-14.

Agkistrodon piscivorus (LACÉPÈDE)—Occasional specimens of the cottonmouth moccasin are taken here and in the surrounding area according to competent observers. They undoubtedly come up from the south along the waterways and since it is believed that only strays reach this part of the country, it is not likely that they actually breed here.

Crotalus horridus LINNÉ—The timber rattler is rare in Jefferson County where it has been taken at Kimmswick and Barnhart. Unlike the copperhead, which does not seem to be much concerned over the encroachment of man in its favorite habitats, the rattlesnake has very definitely been affected by the settling of the country.

Chelydra serpentina (LINNÉ)—The common snapper is often found in isolated ponds to which it must migrate when adjacent temporary streams dry out. Specimens have been taken at Danby, Sulphur Springs, Barnhart, Glen Park, and near High Ridge. They seem to have an unerring sense for the detection of water, an instance of this being the discovery of a garden pool by a large speci-

men which was captured at Danby, escaped from its cage and was not found until several weeks after its disappearance, swimming in the icy but unfrozen water in mid-January. Specimens are often parasitized by leeches.

Terrapene carolina carolina (LINNÉ)—While the Carolina box turtle is not native to this county the writers have been introducing specimens at Kimmswick for the purpose of experiment and as the introduction has not involved too great a geographical obstacle it is hoped that they will survive and eventually become a part of the fauna of Jefferson County.

Terrapene carolina triunguis (AGASSIZ)—The three-toed box turtle is the most common turtle in this county where specimens have been collected at Kimmswick, Sunnyside, Beck, Arnold, Maxville, Festus, Danby, Hillsboro, Goldman, Imperial, DeSoto, Pacific, Sulphur Springs, Barnhart, Seckman, Fletcher, and other places. It is found commonly in the woodlands and fields and large numbers are crushed on the highways each year. Owners of strawberry and tomato patches often find them annoying but seem to realize that the benefits derived from the insectivorous tendencies of these turtles more than offset their depredations on fruit and berries. In the warmest part of the summer they resort to leaves and occasional specimens even develop aquatic habits about ponds.

Chrysemys picta bellii (GRAY)—Bell's turtle frequents the backwaters of creeks and rivers and large numbers have been taken by the writers in adjacent counties. In this county they have been taken at Pevely.

Pseudemys elegans (WIED)—The elegant turtle is of rare occurrence in this county where it has been taken along the banks of the Meramec River.

Pseudemys troosti (HOLBROOK)—This turtle has been taken along the banks of the Meramec and Mississippi Rivers.

Amyda mutica (LE SUEUR)—A specimen of this soft-shelled turtle was taken on the bank of the Meramec River on February 14, 1933. Specimens do not appear to be as vicious as *spinifera*.

Amyda spinifera (LE SUEUR)—The spiny soft-shelled turtle is locally common about running water, principally the larger creeks where they like to sun themselves on the gravel bars. Specimens have been taken in the Mississippi River near the mouth of Glaize Creek at Sulphur Springs and in Glaize Creek at Barnhart.

SUMMARY

In 1911 Hurter listed 102 species of amphibians and reptiles for the state of Missouri, several of which are not now recognized as valid and many of which have undergone a more or less complete nomenclatorial metamorphosis. Since the publication of that list the usual need for revision has arisen. Several new species have come to light, thus aggravating the need for a newer and more accurate compilation of species.

The present paper lists 62 species known definitely to inhabit Jefferson County, Missouri, at this time. In addition to these the writers would like to include the following species which, while not generally classed as native here, are so related to surrounding territory as to make their appearance in this county possible and at least worthy of recognition here:

Gastrophryne carolinensis (HOLBROOK) — The narrow-mouthed toad has been taken in St. Louis County, and since the Meramec River offers ample opportunity for breeding, the species may also be native to Jefferson County.

Natrix sipedon erythrogaster (FORSTER)—This water snake is fairly common just across the Mississippi River in Illinois and it is entirely possible that it may also be found occasionally on the Missouri shore.

Sternotherus odoratus (LATREILLE)—Since the musk turtle is found just across the Mississippi River in Illinois and just south of this county in St. Francois County, it may also occur here.

Graptemys geographica (LE SUEUR)—The map turtle has been reported from the Meramec and Big Rivers by competent observers.

FIG. 1. *Crotaphytus collaris* in fighting mood.
FIG. 2. About to spring.

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PHIL RAU

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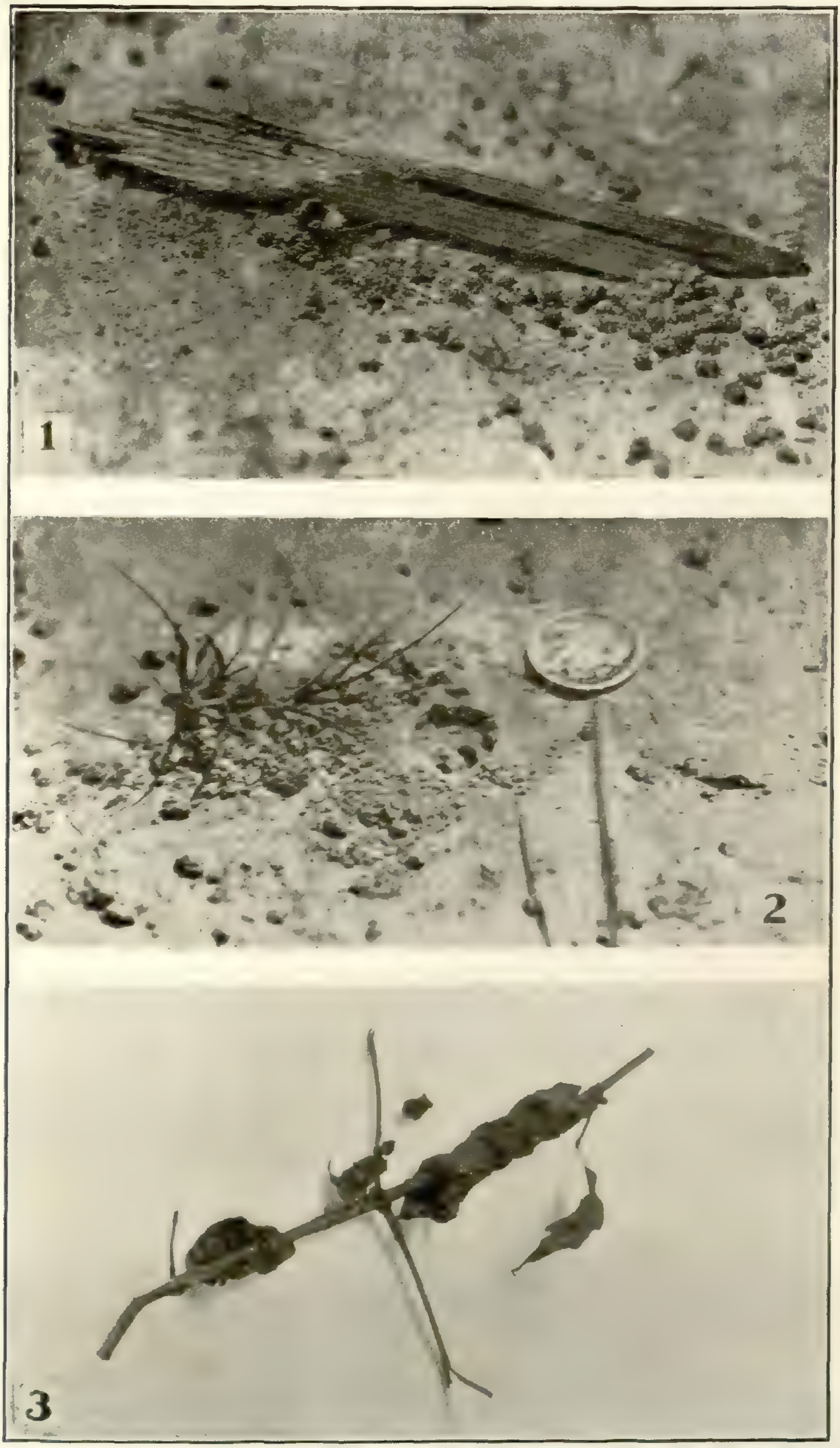

Fig. 1. Nest of the mining-bee, *Emphor bombiformis*, showing the turret over the opening, and a large number of mud pellets nearby.

Fig. 2. The completed nest of *Emphor bombiformis*; where the chimney once stood there is now a saucer-like depression.

Fig. 3. The shed built over a thriving colony of plant lice by the ant, *Crematogaster lineolata*.

Behavior Notes on Certain Ants of St. Louis County, Mo.*

Phil Rau, Kirkwood, Mo.

Lasius umbratus mixus var. **aphidicola** (Walsh) [M. R. Smith]

I have observed the behavior of the exodus of this ant on two separate occasions, and both times it occured near the rear porch of my home at Kirkwood, Mo. Unlike its sister species, *Lasius niger* var. *neoniger* the nests were not at all abundant about the lawn and during the two years only three colonies were observed.

There was a great difference in the dates when the exodus took place; the first was observed on October 13, 1929, and the second on July 6, 1932. In the first instance a large number of ants were seen coming out of the ground near the porch post and they continued to stream out all day, at first in very great numbers and by noon the boards of the porch were black with them. From then on the number gradually diminished until at twilight only a few were coming from the nest. The ants moved about the board in an irregularly upward direction, often pausing to rest on the way for long intervals before finally flying high in the air. There were three house spiders, *Theridion tepidariorum,* at various points about the porch and they fed heartily upon the ants.

At the same spot three years later the same kind of exodus was observed but at that time it occurred earlier in the season, July 6, 1932. These ants were undoubtedly the descendants of the colony observed in 1929. This exodus started between 6:30 and 6:45 a. m. A very large number of winged black ants (queens and males) were climbing up the post for a distance of three feet, and then flying diagonally into the air. There were several hundred wingless yellowish-brown ants, the workers of this species, moving slowly among the crowd of

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**The names of the experts who so kindly identified the material appears in brackets throughout the paper.*

queens and males. This exodus lasted for one-half hour, or until 7:15 a. m., when then only a few stragglers remained near the spot from where they emerged.

At about this time, 7:15 a. m., I noticed a repetition of the same performance some twenty feet away. Hundreds of winged ants were issuing forth from under a flat stone and flying into the air; this lasted one-half hour and here, too, there were many wingless yellow-brown workers among the winged adults. When I examined the stone at 7 a. m., there was no sign of activity, but almost simultaneously all crowded out of the nest at 7:15 a. m., and by 7:45 a. m., all activity was over. It is interesting to compare the hour of the day when emergence occurred. In the two colonies of 1932, the exodus took place in the early morning hours, while in 1929 it occurred in the afternoon.

This colony proved more entertaining than the first one observed that morning because the mass of forthcoming ants was surrounded by hundreds of ants of the species *Formica fusca* var. *subsericea* [M. R. Smith] and these were carrying off the wingless worker ants. They did not venture into the thick of the excitement, but picked them off the outside margin of the ring and carried them off bodily. The workers of *Lasius* fought back desperately and even attached themselves to the legs of their adversaries with their mandibles; they did not succeed however in staying their enemies' progress but instead were often dragged to the nest. One could sometimes see an aggressor making off with an adult in her jaws, and at the same time drag along an ant clinging to her legs.

Lasius niger var. **neoniger** [M. R. Smith]

I never suspected that there were so many nests of this ant about my home, but in an area of about one acre I counted more than 100 colonies nesting on the lawn on August 14, 1932. These nests would have gone unnoticed except that on that day an exodus occurred, and great numbers of ants left the nests and filled the air.

The large winged queens, the tiny winged males and also the wingless workers were on top of the ground about each nest in great numbers. In most of the colonies the males predominated and the workers and queens were less in number, but from one nest came an enormous number of winged queens. In most colonies however the males outnumbered the queens by six to one. They were all moving about nervously in a circumscribed area about each nest and often one could see them rise in flight and soar awkwardly away.

The flickers were especially abundant on the lawn at that time and the birds were exuberantly feasting upon the manna.

Dr. C. H. Turner describes a similar mating flight of *Lasius niger* on September 17, 1913, at St. Louis, Mo., (Journ. Animal

Behavior 5:337-340, 1915) and it is interesting to note that emergence occurred about one month earlier in 1932 than it did in 1913 when his notes were made. In comparing Dr. Turner's notes with my own I find that in both cases the emergence followed a two or three day rainy spell, and in both cases the day was cloudy and also in both cases the mean temperature was 78 degrees F.

Lasius niger americanus (Emery) [Wm. Mann]

At St. Albans, Mo., on a high dry sandy plane above the Missouri River there were hundreds of nests of this ant, sometimes in the open sunshiny spaces and sometimes under logs or bits of wood. (May 16, 1932).

Crematogaster lineolata (Say) [Wm. M. Wheeler]

In an interesting paper on the habits of the tent-building ant, Dr. Wheeler* shows that occasionally, but not always, ants of this species build sheds over their aphid colonies. Since no such instance has been recorded from St. Louis County, and since the shape of the shed differs from those illustrated in the Wheeler article, I think it well to record the same here. The shed (fig. 3)† attached to a twig two feet from the ground was taken at the outskirts of Kirkwood, Mo., in a low valley near a creek on October 13, 1928. This was an unusually warm day for so late in the season and when a portion of the wall was opened about 200 aphids and about 50 ants were found. Specimens of the ants were identified by Dr. Wheeler, but unfortunately the aphids were lost in transit when sent to a specialist for naming. The location of the nest near the creek and also the late date, October 13, when the thriving colony was found is interesting in view of the fact that Dr. Wheeler, in seeking an explanation for the occassional shed building behavior of this ant, calls attention to the fact that most of the authors have found the *lineolata* tents late in the season, August and September, in damp localities. Therefore it seems likely that sheds are built only when the aphids need protection from moisture or cold. He says further that the cold due to greater evaporation in such places, coupled with the lateness of the season, would probably tend to inhibit the feeding activites of the aphids and in order to give off honey dew the aphids must feed. The ants by protecting the aphids from cold may "prolong their feeding hours and increase the excretion of honey

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**Bull. Amer. Mus. Nat. Hist., 22, 1-17, 1906.*

†Unfortunately the middle lower portion of the shed was lost before it was photographed.

dew. This would, of course, be of decided advantage to the ants."

Crematogaster lineolata var. **cerasi** (Fitch) [M.R.Smith]

I have seen this ant associated with termites occasionally and I have begun to wonder if there is not some very definite relationship between them. An opportunity at Wickes, Mo., on May 1, 1932, gave me the following notes. A large board lying on the ground was on top of another one, half buried in the ground. Upon lifting the top one I found thousands of the above species of ants packed closely together on both boards; also many ants were in the termite galleries with the termites. The termites, *Reticulitermes flavipes* [M. R. Smith] were few in number in comparision with the ants, although the galleries would indicate that a large colony was present.

That the relationship between the two species was something more than accidental was indicated by the behavior of the ants; the moment the top board was lifted, the ants grabbed the temites in their jaws and ran for whatever cover they could find. This might indicate a friendly spirit on the part of the ants or it might indicate that the ants had planted themselves in the termite colony and were slowly devouring the inmates. Many of the termites were winged and as I lifted the lower board many tried to escape in the hole in the ground.

This was an interesting colony in that I also found about twenty specimens of the guest orthopteron identified as *Myrmecophila pergandei* Bruner [A. N. Caudell] and ten larvae of a guest Lepidopteron belonging to a Teneid moth [Wm. M. Wheeler]. The latter lived in flattened kidney-shaped cocoons open at both ends and much too large for them; the cocoons were lying flat on the earth covered by the board. Each larva moved about slowly carrying its case, and each spun a silken thread as it walked along; if the pill box in which they were placed was turned upside down, it was evident that one end of the thread had been attached to the box and the insect hung free in the air. In a crowded box, they often attached themselves to one another by means of this thread.

We have seen on previous pages that *C. lineolata,* while normally nesting in crevices in boards and hollow stems, sometimes builds sheds on plants over her colony of aphids; for the variety *cerasi,* I wish to record another and unusual method for protecting the "cows". At St. Albans, Mo., on May 6, 1932, on a large shrub I found in a dozen or more places, batches of leaves crumpled and adhering together. In the center of each batch of these leaves I found a number of aphids* attended by

these ants. The leaves were treated in such a way as to completely hide and protect the aphids.

Formica sanguinea sub-sp. **subintegra** and **Formica fusca** var. **subservicea** [M. R. Smith]

I had read of slave raids but had never witnessed one, so I was delighted to see the process going on in my backyard. On Saturday, July 29, 1932, a member of the family saw a large number of ants very busy in the drive-way and as their activity continued through to the next day my attention was called to them. They probably worked all night for at 7 a. m. I found them still active. The red ants, the slave makers, *Formica sanguinea* sub-sp. *subintegra* Emery, were moving in two more or less haphazard single files, one in each direction. Those going north were empty handed but each ant going south carried a black ant; some of the black ants were alive and struggling fiercely and others were dead. They were moving over a cement walk for some distance and then over grass, sticks and pebbles, finally disappearing in a crack in the earth under the walk some forty feet away.

This raid was carried on, on a large scale for about one and one-half hours that morning, and then the participants dwindled in number so that by 10 a. m. no more were seen. Many of the slave makers had congregated at the opening and I was surprised to see that several of the slaves were there too, freely mingling with their masters. Mr. M. R. Smith who examined both species for identification, found that the slaves were infected, as have been other species of ants taken in my yard, with the parasitic fungus, *Laboulbenia formicarium.*

Formica pallide-fulva var. **nitidiventris** (Emery) [M. R. Smith]

About six weeks after an empty soap-box was placed on the bare ground in an open shed, (September 15, 1931), a thriving colony of ants of this species was found nesting in the ground under the box. The ants were very active on top of the nest during the night. I often amused myself by watching them carry into the nest bits of raw beef and granules of sugar which I placed on the ground. But of most interest were the beetle, orthoptera and lepidoptera guests that were found at the opening of the nest when I lifted the box. On September 15, ten caddice-like worms protruded from the rounded neck of their houses (two of them however were completely sealed and were probably in pupal stage). The cases were made of mud by the larvae of the little Chrysomeled beetle, identified by Dr. Wm. M. Wheeler as *Coscinoptera dominicana.* These ten were taken and the next day at 8 a. m. two more, and finally at 7:30 p. m. three additional ones were taken at the opening.

These fifteen beetle cases seemed to be the entire population for on several subsequent examinations no others were found. The larvae quickly retreated into their shells when touched, and they lived in the laboratory for a few weeks feeding on apple. It was amusing to see the larva, with the head and four or five segments of the body hanging out of the bag, biting away at a tiny bit of apple held by the front legs in squirrel-like fashion, devouring in this manner mouthful after mouthful of the fruit.

The larva walks about on the floor with only the front half of the body protruding from the cocoon, and as it transports itself it drags the bag along in a snail-like manner. The last segments of the body are misshapen and remind one of the posterior segments of the hermit crab which lives in a manner not unlike this little ant guest beetle. These last segments of the beetle adhere in the same way to the cocoon as does the shell of the hermit crab and one cannot remove the insect from it without destroying the case. I have kept several specimens alive in the laboratory without food for one week.

About ten days later I took from the top of the same nest a half dozen of the flattened cases made by a *Tineid* moth. [Wm. M. Wheeler] and from time to time I picked up several orthopterous guest insects that were identified by Mr. A. N. Caudell as *Myrmecophila pergandei* Bruner.

Formica fusca var. **subsericea** (Say) [M. R. Smith]

For about eight years I have noticed in my back yard about one-half dozen mounds of this ant that were quite large (6 or 8 inches high and 18 to 24 inches in diameter) and in addition for the past three years an enormous colony has covered my terrace with the pellets from their nest excavations. All of the nests were dug in grassy or weedy plots and on level ground and had several openings in each. The site is used by the colony for several years, and I have definite information that one such colony inhabited a small mound for three consecutive years.

Early in April of each year great excavating activity occurs about nests; the ants work at night as well as by day during the spring rush, but later in the summer excavating activities are seldom seen. The workers during July were often seen at dishes of honey placed outdoors to attract other insects and they gathered this honey during the day as well as during the night.

The mature forms leave the nest in June and July as the following records show:

June 13, 1930. One winged queen at the electric light.

June 23, 1930. Several winged males and one enormous wingless queen at the electric light.

July 25, 1930. Many winged ants of this species seen about the yard and house during two days.

July 24, 1932. Several winged ants seen about vegetation and one trapped on screened porch.

The ants were submitted to Mr. M. R. Smith for identification, and he also found the specimens infected with the parasitic fungus, *Laboulbenia formicarium* Thaxter. Mr. Smith writes that although he has noted the fungus on other species of ants it is by no means a common thing to find it on *Formica fusca* var. *subsericea*.*

It was noted that these ants were very attentive to tree hoppers. A blue flowering thistle plant in the garden harbored on the underside of its leaves many adult as well as immature tree hoppers identified by Mr. P. W. Oman as *Entylia concisa* Walk. There were from four to sixteen tree hoppers on each of many leaves, and also about one-fourth as many ants. The ants were in constant attendance and even at night they could be seen passing the antenna over the bodies of the hoppers. The big clumsy ants looked comical as they stroked the tip of tiny nymphs in an effort to increase the honey flow. The plant was watched intermittently from the time the hoppers and ants were first seen, July 10, 1930, until September 22, 1930. They could be seen together at any time during this period if one chose to look for them, but during September both ants and tree-hoppers were very few in number. On July 24 and on August 15 the same behavior was seen on a stunted giant rag weed plant growing in a shady place but in this case the hopper was identified by Mr. F. W. Oman, as nymphs and adults of *Publilia concava* Say.

Eciton schmitti [M. R. Smith]

Some years ago at dusk I discovered a colony of this ant on a maurading expedition at Wickes, Mo. At that time (See Trans. Acad. Sci. St. Louis 24:41, 1922.) Dr. Wheeler wrote that the northern limit of this species is Doniphan, Mo., which is near the Arkansas border. On May 30, 1931, at Ranken, Mo., about 23 miles northwest of the Wickes region I found two strong colonies in two fallen decayed oak logs; these logs were some distance apart. There was a big-bodied queen in each colony surrounded by several thousands of clustering workers. They hung on to one another in deep masses just as I have seen a sister species of *Eciton* do in Panama.

**The reader is referred to an interesting paper by Mr. M. R. Smith on the subject of parasitic fungus on ants in Bull. Brooklyn Ent. Soc. 23:104-106. 1928.*

Both colonies were under loose bark in depressions made by other insects; in the one case they used the old galleries of a Camponotus carpenter ant, and in the other case a pocket made by a rodent. In the one colony I found a few small batches of eggs but no larvae; in the other a few small larvae but no eggs. The ants had adopted the logs as a home and were probably preparing to stay there although in the tropics members of this genus are on the march almost constantly.

Prenolepis imparis (Say) [M. R. Smith]

On February 28, 1932, an unusually warm day with the temperature at 65 to 70 degrees F., between 1 and 3 p. m., the air over a small trickle of water from a spring at Creve Couer Lake, Mo., was thick with these winged ants. Thousands would fall into the water and accumulate in masses and were helpless to extricate themselves. The specimens taken were all males. Elsewhere the same day in the same region many winged and wingless ants were taken from the ground and these identified by Mr. M. R. Smith as *P. imparis* var. *testacea* Emery.

Monomorium minimum (Buckley) [M. R. Smith]

Thousands of these ants came to a piece of raw beef and also to honey placed for bees in my yard at Kirkwood, Mo., on June 15, and 18, 1932.

Iridomyremex pruinosus var. **analis** (Andre) [M. R. Smith]

At St. Albans, Mo., on the Sandy Shore above Missouri River, on May 6, 1932, a very dry log sheltered under its bank a nest of this species.

Solenopsis molesta (Say) [M. R. Smith]

Many of these tiny ants were feeding on the dead body of a queen wasp, *Vespa germanica*, at Kirkwood, Mo., June 24, 1932. I wondered how these very tiny ants could penetrate the thick chitin of the wasp, but soon found an entrance hole where one eye had been bitten out; the colony was shaken into a vial from this opening. These ants have been seen hereabouts on several occasions but their very small size made capture difficult.

Camponotus (Myrmentoma) caryea var. (Fitch) [Wm. M. Wheeler]

A swarm of these ants was coming out of the burrow belonging to the carpenter bee, *Xylocopa virginica*. This nest was in a horizontal board of pine that I had harbored and watched for 13 years but this is the first time that this ant had even been seen about it. They had a nest in this burrow and the swarming behavior was observed on April 30, 1930; several of the

ants were walking about the board, but a great many workers and a few queens were crowded about the opening before flying away. When I attempted to take them many hurriedly walked back into the burrow.

Camponotus herculeanus sub. sp. **pennsylvanicus**

[M. R. Smith]

There is a nest of Camponotos ants in the tree a few yards from the house and our kitchen sink and pantry offers them foraging and feeding opportunities. In fact they were encouraged in this and it is interesting to watch them come and go during the day and during the night as well, gathering jelly, honey, syrup, cantaloupe, watermelon juice, bits of orange, meat and sugar.

The dates each year when they began to make inroads to the sink varied as shown below; 1928, April 4; 1929, March 22; 1930, April 11; 1931, April 15; 1932, April 8. They are usually about the kitchen until June 1 to 15 and then they disappear. During the drought year of 1930 however, they continued to come into the house until September 5; in 1934, also a severe drought year, they continued to come into the kitchen until August 25. Both summers witnessed severe droughts and the sink afforded plenty of moisture in the form of water or fruits.

These ants foraging at night proved a nuisance to some of my cage insect material. They entered the cages and on several occasions carried away piece-meal, many sleeping Polistes wasps and Xylocopa bees.

I have noted a war of this ant on members of its own species on July 10, 1926. While these ants came on foraging expeditions to the kitchen, they had never come into my laboratory. I was indeed surprised on that day to find hundreds of dead ants of this species strewn on the floor, and in addition 25 or more were in actual combat, brother against brother. Other ants, at the same time, were dismembering the bodies of their fallen brethren and carrying portions of their bodies to the nest. I do not know how long this deadly strife had been going on but judging from the number of dead it must have been going on for a long time. It certainly was an ant battle, but the unusual thing was that both victor and vanquished were of the same species. It might have been a rival nest; it could hardly have been a war between casts in the same nest, because all were of the same cast.

Winged queens were taken at various times of the year as follows: February 3 and in March 1931; July 31, 1932; May 6, 1932. These dates are in line since it is generally known that the queens become mature in late summer, but do not remove their wings or leave the nest to found new colonies until the following spring.

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Notes on the Behavior of Certain Solitary and Social Bees

PHIL RAU

Issued December 31, 1934

Notes on the Behavior of Certain Solitary and Social Bees*

Phil Rau, Kirkwood, Mo.

Colletes inaequalis (Say)

About twenty bees of this species were at play in the air at a moist spot in the road bordering a small stream at Ranken, Mo., April 19, 1931. These were seen in this attitude all day. I was directed to this spot by Dr. Meiners who had seen the colony at the same place one day a week previous. He had seen the bees performing a courtship dance with many matings while they were on the wing. Today only females were present and they divided their time equally between dancing in the air and resting on the moist ground. When at rest their tongues were fully extended and were seen to drain moisture from the surface of the mud and from bits of wood nearby. No nests of this burrowing bee were to be seen.

Megachile montivaga (Cress)

A hollow sumac twig containing the nest of this leaf-cutter bee was taken at Kimmswick, Mo., early in the spring of 1926. Five adult bees emerged within a three day period between May 26 and 28.

I was especially attracted to this twig because of the unusual method practised by this mother in closing the nest. She made a heavy plug over the outside opening in the stem in addition to the usual plug over the series of leaf cups two inches below. This outside opening in the side of the stem was probably made by a woodpecker; the mother bee, it is interesting to note, while usually only placing a plug over her row of cells, in this case also placed a second plug at the opening in the wall evidently to make it doubly secure against parasites. This shows that there was a slight bit of intelligence in her method.

**All bees and parasitic wasps mentioned in this paper, except those marked S. A. R. were identified by Dr. Grace Sandhouse. Those marked "S. A. R." were kindly identified by Mr. S. A. Rohwer. All plants were named by Dr. Robert E. Woodson.*

Megachile brevis (Say)

A leaf-cutter bee, carrying a bit of green leaf was seen to crawl under a loose rock at the side of the road at Kimmswick, Mo., on September 28, 1930. Lifting the rock I found a cup made of bits of petals cut from the blossoms of Acacia flowers. The outside of the cup was composed of several layers of bits of these petals so tightly pressed together that they could hardly be separated. The mother had probably moistened them with saliva before pressing them together. The inside of the cup was made of bits of green leaves. This species also nests in the pitchers of pitcher plants, *Sarracenia minor*. Among the plants brought to me from Tifton, Ga., a three celled nest made of bits of leaves was found. One gave fourth an adult September 13, 1932.

Megachile pugnata (Say) [S. A. R.]

Dozens of these bees were seen flying low near the ground in an open railroad shed at White House, Mo., on June 16, 1922. They were seen in a courtship dance for an hour, weaving in and out just above the gravel floor. A pollen laden female was seen to fly in their midst, and mating with one of the males took place immediately.

Megachile sp.

Megachile bees make nests in various hollow objects. They may be seen nesting in hollow twigs and in the Anthophora bee burrows, in holes in rocky cliffs, etc. I wish here to record that this unidentified species makes nests in the large hollow chalcid-wasp galls knows as oak apples. One such nest of several cups, made of cuttings of green leaves, was taken on October 1922, at Barnhardt, Mo.

Andrena perezana (Viereck & Ckll.)

Many bees were seen occupying burrows in a large clay-bank at St. Albans, Mo., on May 6, 1932. I could not tell whether the burrows were made by the bees or whether they were using burrows abandoned by other insects. It was interesting, however, to see that several bees were biting the sandy soil from the opening of their tunnels and scraping it back into their burrows. This material was probably used as filler and the behavior demonstrates that even though the bees may use ready-made burrows they have not lost their ability to use their jaws on the soil.

Andrena rudbeckiae (Robt.)

Several bees were taken from flowers of black-eyed Susan, *Rudbeckia hirta*, at Glencoe, Mo., June 30, 1930.

Andrena geranii maculata (Robt.)

Very many of these bees were seen going to the flowers of the spring beauty, *Claytonia caroliniana*, on my lawn at Kirkwood, Mo., April 11, 1930.

Hylaeus modestus (Say)

A twig brought to me from Kimmswick, Mo., early in October, 1929, contained a mother in the top portion and six cells below. The cells had three larvae, two pupae, and one parasite and all were destroyed by a growth of fungus. I have no proof however, that the nest belonged to this mother; she merely may have crawled into the twig to hibernate or to die.

Agapostemon radiatus (Say) [S. A. R.]

Dozens of these bees were at work burrowing vertically in a bank of very fine sand at Creve Coeur Lake, Mo., August 8, 1922. They were seen to enter their burrows head first. I opened one of the burrows and found it about 3/16 inches in diameter and 15 inches deep. This tunnel was probably incomplete for the mother was at the bottom and there was no evidence of brood chambers.

Agapostemon texanus (Cress)

One bee was seen feeding on honey placed in a saucer for honey bees in my garden.

Melissodes hitei (Ckll.)

Several bees were taken on the flowers of hen-pepper, at Meramec Highlands, Mo., August 14, 1932.

Tetralonia atriventris (Sm.)

The automobile radiator as it sweeps through the air is a large factor in affecting the balance of life, and insects come in for their share of elimination. An interesting record was made when I examined a radiator at Fort Atkinson, Wis., May 31, 1932. Eight bees, three males and five females of this species, still alive, were removed from the front of the car. The colony was evidently in the midst of a courtship dance over the road, when the automobile scooped up a portion of the dancers. I say "courtship-dance" rather than the usual term "sun-dance" because the sun was not shining and a cloudier or drearier day could hardly be imagined, yet these supposedly sun-loving bees were abroad in numbers.

Tetralonia rosae (Robt.)

Both sexes were taken from flowers of the weigelia, *Diervilla* Sp., in my garden May 11, 1930.

Emphor bombiformis (Cress)*

These bees abound about the St. Louis region and can be seen at bald areas such as base-ball diamonds in late summer. The mother bees bring in water in which to carry on their mining operations, use a small portion of the excavated material to build turrets around the nest openings, and then kick out to a distance the surplus pellets; (both turret and pellets can be seen in fig. 1). Finally when the burrow is completed the material in the turret is packed into the gallery. This is done by again carrying water, wetting portions of the chimney, biting away the mud and carrying it into the hole. There is usually not enough material in the turret to completely fill the hole and one often sees saucer-like depressions on the surface of the ground as in fig. 2. This tell-tale depression makes it easy for the investigator to locate completed nests for excavation and study. Many nests were seen on the baseball diamond at the Concord Schoolhouse near Kirkwood, Mo., July 27, 1930, where the photographs were taken.

Anthophora walshii (Cress)

Many bees were seen gathering pollen from the yellow flowers of *Solanum rostratum*, at Old Mines, Mo., September 12, 1930.

Entechnia taurea (Say)

Since writing about these mining-bees in "The Ecology of a Sheltered Clay Bank" (Trans. Acad. Sci. St. Louis, 25: 150-277, 1926) I have seen about a dozen colonies at various places in St. Louis County and they always were near streams. This of course is what one would expect since they need water for excavating purposes. In returning to the clay-bank at Wickes, Mo., (where the above ecological study was made) after an absence of eight years I was surprised to see the enormous increase in the population of this bee. In the above work I show that for a period of six years, from 1917 to 1922, the number of nests in this clay bank was 62, 55, 37, 49, 51 and 40 respectively, therefore I was delighted to count 198 nests with turrets in this same small bank on August 28, 1930. Something in the environment, either water or blossoms or lack of parasites have given *Entechnia taurea* an advantage over the other mining-bee *Anthophora abrupta*. The population of the latter had greatly decreased while that of *taurea* more than quadrupled in a period of eight years. I planned to make an intensive study of the populations of both species the following year, but when I returned I found the building that sheltered

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* *A full account of the habits of this bee appears in Bull. Brooklyn Ent. Soc. 25: 28-35, 1930.*

these populations was occupied and the clay bank had been entirely destroyed.

In their foraging expeditions, this bee sometimes falls prey to spiders. One bee was seen emmeshed in the web of the orb-weaving spider *Miranda* sp. and on July 6, 1930, I was attracted to the clay bank by the "squeaky" sound of this bee and found a female struggling in the grasp of a jumping spider, *Phidippus audax-tripunctatus* Hentz.

Augochlora (Oxystoglossa) pura (Say) [S. A. R.]

A half dozen cells of this bee was taken from under the bark of a rotten log at Wickes, Mo., each cell had a pellet of bee bread with an egg or tiny larva. Three adults emerged from these cells from June 8 to 11.

Halictus provancheri (D. T.)

A dozen bees were observed going to flowers of the yellow sour grass *(Oxalis stricta)* at Wickes, Mo., May 24, 1931.

Halictus (Chloralictus) sp.

A large colony of these bees was found making horizontal nests in a slight elevation of earth that was thickly matted with fine roots. There were about 25 such nests and a good many more bees, since many individuals were coming in and going out of each nest. The doorway of each nest had a guard whose head snugly fitted the opening. The tunnel was larger than the door-way and permitted the guard to back down so that an incoming bee could pass over its body into the depths of the nest. On June 29, 1930, I saw an incoming pollen-laden mother chase away a parasitic wasp, *Pseudomocthoca canadensis* Blake, that was at rest near her door-way, and in digging open a nest later in the day, I found another parasite *Brachycistis bimaculatus* Fox in the tunnel.

Halictus ligatus (Say)

Many bees were taken from the flowers of black-eyed Susan, *Rudbeckia hirta*, at Glencoe, Mo., June 15, 1930.

Halictus illinoensis (Robt.)

Several specimens were taken as they were feeding on the flowers of the flea-bane, *Erigeron* sp., at Ranken, Mo., June 13, 1930.

Bombus americanorum (Fab.)

This bumble-bee, a ground-nesting species, sometimes transgresses from its normal behavior, and founds colonies in such unusual places as a hanging paint bucket, a sack of straw on a cabin floor, a box of carpet rags and other such places as

have been already recorded.* In addition to unusual nesting places I want to record the nest of this bee in my own barn. This was on the floor in the corner of a dark closet and about 15 feet distant from the big door which was always open. The bumble-bees came and went through this door, but could only enter the closet through a small hole in the wall near the floor. I do not know how the queen discovered this spot unless she found it a good place for hibernating during the winter, and then remained to found her colony in the spring. This made an ideal nesting site because on the floor near this hole was an abandoned mouse's nest which with its mass of dry grass, small chips of wood and bits of newspaper gave ready-made nesting material. It was interesting to see that the queen did not make her nest on top of this pile, neither did she make it on the floor under it, but somehow she worked the brood and honey pots half-way in between the mass so that a portion served as a floor and another portion the roof. This colony never reached large proportions however; I doubt if the population contained more than twenty workers even in late summer.

There are two other details of behavior that interested me about the few bumble-bees that came into my back yard; one was that queens of this species were often seen at the flowers late in the spring, when the workers also appeared. One suspects that when workers were on hand to do the foraging, the queen would remain in the nest and in termite-fashion revert to an egg-laying machine. Both queens and workers of this species were seen on the flowers in 1934 as late as June 16 and in 1931 I noticed queens at the flowers as late as June 28. The other item of interest is that often a heavily pollen-laden worker or queen goes into a flower to gather nectar; several observations have convinced me that this species does not exclusively gather one or the other crop on any one foraging trip, but often on one trip gathers both products.

Workers of *americanorum* were seen gathering pollen or nectar from the following flowers: Japanese honey suckle, *Lonicera japonica;* blue and pink larkspur, *Delphinium ajacis;* blue flowering myrtle, *Vinca minor;* beards tongue, *Penstemon* sp.; pink weigelia, *Diervilla* hort. var.; white dutzia, *Deutzia* hort. var.; bouncing bet, *Saponaria officinalis;* iron weed, *Veronia* sp.; dewberry, *Rubus* sp.; yellow flowering solanium, *Solanium rostratum;* scarlet lobelia, *Lobelia siphilicta.* They were also seen foraging among the common garden plants as follows: pink and white hardy sweet peas, yellow Japanese iris and zennia.

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*Howard, Ent. News 29: 114, 1918; and Rau, Ann. Ent. Soc Amer. 17:368-381, 1924.

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Observations on the Life History of the "Baltimore Checker-Spot" Butterfly, Euphydryas Phaëton in Missouri

HAROLD I. O'BYRNE

Issued December 31, 1934

Observations on the Life History of the "Baltimore Checker-spot" Butterfly, Euphydryas phaëton (Drury), in Missouri

By Harold I. O'Byrne

Euphydryas phaëton (Drury), named "The Baltimore" many years ago in honor of Lord Baltimore, is in some respects the most interesting of the butterflies native to the region about St. Louis. The species is extremely local in distribution and the butterflies seldom wander far from their birthplace; the caterpillars are social, living in a common nest, and they hibernate when half grown; the diet of the caterpillars is curiously restricted, and their choice of food differs before and after hibernation. Although the details of the life history of this insect, as it takes place in the neighborhood of Boston, have been well told by Scudder,* observations made in the vicinity of St. Louis show some interesting differences.

The essentials of Scudder's account may be briefly stated. The butterflies are seldom found far from the marshy places where the food plant, snakehead *(Chelone glabra)*, grows. The eggs are laid in clusters on this plant between July 5 and 15, and hatch in 19 or 20 days. Each caterpillar devours part of the shell of the egg from which it hatched; then, before eating any part of the leaf, the entire colony of caterpillars spin a small web on its lower surface. They eat only the parenchyma covered by this web for a time, then they construct a covering web over the topmost leaves of the plant and feed on the enclosed leaves. As these are consumed the web is extended, although individual larvae often leave the web and feed on leaves outside. Damage to the web by rain or other causes is repaired at once, and the web is continually being improved and strengthened until after the third molt. During this time the droppings and shed skins accumulate, and the supporting leaves dry up and turn black, but in spite of its filthiness, the caterpillars con-

*Scudder, S. H. *Everyday Butterflies. Cambridge, 1899.*

ERRATUM
Pages 228 and 229
are Transposed

found feeding on *Pentstemon hirsutus* and on *Symphoricarpos orbiculatus* (of the Scrophulariaceae and Caprifoliaceae, respectively) at Ranken, and on the *Pentstemon* at St. Clair. That same spring some larvae collected at Allenton and Antonia the preceeding fall and kept outdoors through the winter escaped from their cages and were found in the writer's yard, feeding on a species of *Veronica* that was growing as a weed there. These escaped larvae and caterpillars collected on *Pentstemon* all accepted both *Pentstemon hirsutus* and *Veronica* and completed their development.

On June 21, 1933, six large clusters of eggs were found on the under side of leaves of *Aureolaria grandiflora;* they hatched between June 25 and 30, all of the same batch hatching on the same day. Since the *Veronica* and *Pentstemon hirsutus* were all gone by this time, and *Aureolaria* not available at the writer's home, *Pentstemon laevigatus* was tried, and the young caterpillars accepted it. Experiments were then tried with other plants, but none seemed to be relished. Even the *Pentstemon* accepted did not appear to be entirely satisfactory; the larvae did not thrive on it and only a few succeeded in reaching the stage of inactivity that precedes hibernation, and these were of small size. The plants rejected were *Symphoricarpos orbiculatus Sambucus canadensis, Campsis radicans* (the caterpillars accepted this at first, but after eating a little stopped and refused to touch it further; they died soon afterward), *Datura stramonium*, and cultivated *Petunia.* The rejection of the last two was to be expected, since they are not related to the plants known to be acceptable, but it is surprising that they reject *Symphoricarpos orbiculatus* at this time but thrive upon it after hibernation. Their attempts to nibble the leaves of the trumpet vine *(Campsis radicans)* present an interesting problem, and this plant should be tested upon caterpillars after hibernation. It is possible that the difference in food habits shown before and after hibernation is merely the result of the difference in size of the larvae, and that the larger caterpillars in the spring can eat plants which, because of the thickness or texture of their leaves, cannot be eaten by the little newly-hatched larvae. It is certainly to their advantage to have more varied tastes in the spring, because at this time the new shoots of *Aureolaria* are barely showing above the ground.

After reaching the butterfly stage, the Missouri representatives of this species show behavior that differs from that described by Scudder in two respects. First, the butterflies do not stay in the immediate neighborhood of the food plant, but usually make their way down into the valleys as much as a quarter or half mile away. Second, although a few are often

tinue to dwell in the nest until spring. In the latter part of August in the north, and about the middle of July in the south, the caterpillars stop eating and become inactive, yet they are not dormant, as they crawl about immediately when the nest is disturbed. They do not resume their activity until spring, when they abandon the web and begin to wander. At this time they feed upon *Lonicera* and other plants, conspicuously exposed except when molting or during storms. They attain full growth in May; the pupal stage lasts from 14 to 18 days; and the earliest butterflies appear in southern New England at the end of May or beginning of June. In the vicinity of Boston they are seldom seen before June 12. Scudder says in regard to the food plants, that "the principal food of the caterpillar, at least when young, is the snakehead, *Chelone glabra,* but it feeds also on other scrophulariaceous plants, and when past middle life, on *Lonicera* and other caprifoliaceous plants." Most other popular books on butterflies mention only snakehead.

In the wooded, hilly country southwest of St. Louis, the *Euphydryas phaëton* butterflies are seen every year, but usually in sparse numbers, first appearing after the middle of May and lasting a month or more. There are no marshes in this territory, and the butterflies are most often seen in the dry valleys, and occasionally on the hillsides. *Chelone glabra* does not grow in these places, and local collectors have for a long time been baffled in their attempts to reconcile the distribution of the butterfly in this region with what is known about its life history and behavior.

During the summer of 1932, the writer found a number of nests containing caterpillars of this species on a tall, yellow-flowered gerardia (*Aureolaria grandiflora* Benth.),* which grows on the oak-covered hillsides where the butterfly is sometimes found. Nests were found on this plant at Ranken (on two different hills), Allenton, and near Antonia; in the succeeding years many nests were found in these and several other localities. No nests have been found on other plants of the same family (Scrophulariaceae) or on caprifoliaceous plants. In the spring of 1933, however, nearly or quite full grown larvae were

*Other observers also have reported this caterpillar on Aureolaria. Aretas A. Saunders ("Butterflies of the Allegany State Park," N. Y. State Museum Handbook 13, 1932) found the caterpillars on yellow gerardias (Aureolaria) both in spring and fall in Connecticut, and noted the butterflies on a high, dry, rocky ridge where this plant grows. He was unable to induce them to eat snowball (Viburnum tomentosum) and they seemed to dislike Japanese honeysuckle (Lonicera japonica). A. E. Brower ("A list of the butterflies of the Ozark region of Missouri," Ent. News, XLI, 9:286-289, Nov., 1930) found nests of the larvae on tall-growing gerardias high up on dry, thinly-wooded ridges near Willard, Missouri.

to be found flying in one spot, they never occur in large companies. Only one butterfly has been seen by the writer in close proximity to the food plant—this was a female feeding on flowers near a group of *Aureolaria grandiflora*. In the valleys not far away, both sexes were seen. This suggests that the butterflies, on emerging from the pupae, descend into the valleys for shelter from the wind or for food. There mating occurs, and the females return to the hillsides to lay their eggs. This procedure should facilitate cross-breeding between the different colonies and thus aid in the dissemination of the species. The large colonies of butterflies described by many authors as inhabitating marshy places in the eastern part of the country remain in the neighborhood of the food plant, so breeding probably takes place between members of the same local group year after year.

The foregoing observations suggest interesting possibilities for further study of the life history of this butterfly. Why the female selects only one plant in this region on which to lay her eggs, although the caterpillars will accept other related plants; why the caterpillar's diet is more restricted before hibernation than afterward; why they live in a nest until spring and then forsake it, while other not distantly related species also hibernate when half grown but make no nest at all; why the butterflies leave the scene of their larval existence, although the females must return there to lay their eggs; and why the life history and behavior of the species differ in different parts of the country are some of the problems that still await solution.

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Biologic Investigations on the Staphylinidae (Coleoptera)

RALPH VORIS

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Biologic Investigations on the Staphylinidae (Coleoptera)

RALPH VORIS

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Springfield, Missouri*

INTRODUCTION

This paper is a discussion of the feeding, mating and pupation behavior of the beetles of the family Staphylinidae together with a review of the literature on these subjects. In addition to field data, the conclusions are based on observations made while handling 1084 cultures of immature and adult forms.

The study began as a general investigation of the fauna of dung. The Staphylinidae are more abundantly represented than any other group found in dung, but their relations to the substratum and to the other insect life have never been discussed in detail. Finding that my observations were proving distinctly contrary to the current conceptions on these points, my attention soon narrowed to the Staphylinidae.

The habitats in which rove beetles are found vary so widely that one is not greatly surprised to find them anywhere. The most common habitat is decaying organic material such as dung, carrion and rotting grass or leaves, but we find a large number under the bark on dead trees and under stones. There is a considerable staphylinid fauna to be found in the nests of birds, reptiles, mammals, and insects such as ants, termites, bees and wasps. There are some that are parasitic on the South American opossum. Plant structures, such as flowers, have their regular staphylinid visitors while some of the beetles spurn cover of any sort and spend their time running about on the shores of

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lakes and streams. In short, the behavior is so varied and the number of species in the family so large that a simple statement of habitat can not be made.

Methods. Field observations were made whenever possible but the active behavior of both the larval and adult staphylinids prevents one from observing them for many minutes at a time. Adults and larvae collected for observation were placed in small vials with some of the material of the habitat in which they were found. Only one larva of a larger species may safely be placed in a vial as the insects readily kill one another. Immediately upon reaching the laboratory the live larvae were transferred into tin salve boxes surrounded by the material in which they were captured. This material usually contained a considerable fauna of insects and other organisms, and in it the larvae found their food. When pupation occurred the insects were placed in other salve boxes containing moist cotton or sand. This precaution was usually sufficient to protect the pupae from mites, nematodes, and fungi. The live adults were kept in six ounce bottles or small fruit jars. The bottoms of the jars were covered with moist sand, and food material was added from time to time. Some of the live adults were placed in cultures of *Drosophila* and as long as the flies were in good condition, there was an abundance of food for the staphylinids. Occasionally the beetles would be trapped in folds of the wet paper and would drown or they would work their way thru the cotton plug (which was used in place of a cork) and escape.

Each culture was checked regularly. This necessitated tearing apart the materials in each container until the larva was found, and I am sure that this disturbance caused a number of casualties. The difficulties in maintaining the larvae over a period of time were numerous. Mould caused the death of a number. Free-living nematodes were responsible for a large number of losses. Mites chewed their way into a few pupae and killed them. The most important factor was moisture. If there was an excess of water, the larvae were trapped in the droplets and were drowned, and if there was not enough, they soon dried up.

Acknowledgments. I wish to express my appreciation to Indiana University for the aid which has allowed me to pursue this work; to the faculty of the Department of Zoology for their advice and criticism, especially to Dr. A. C. Kinsey for directing this work; to the U. S. Nat'l Museum, Illinois State Natural History Survey, A. G. Boving, E. A. Chapin, A. M. Banta, T. H. Frison, and L. G. Saunders for the loan of material; and to Mr. Howard Notman who made or checked the determinations of the adult insects mentioned in this paper.

Behaviors Studies

Feeding Behaviors

Staphylinid feeding behaviors have never been clearly defined. Such epitaphs as *short-winged scavengers*, and their presence in and about putrid and decaying organic matter has lead many to believe that they were carrion feeders. There are a large number of isolated observations of predatism in both the larval and adult stages but these observations have been considered as exceptions and not as the general feeding behavior. The economic entomologists have reared a few species from the puparia of root maggots and these observations have given rise to the feeling that some of the family are parasitic. The behavior of the myrmecophilous and termitophilous staphylinids show the predacious behavior of the group, but predatism has never been considered as common as my experiments show it to be.

As Scavengers. Feeding on dead material does not constitute scavengerism, for dead plant and animal food materials, free from decay, are not radically different in food value from those same materials in the living organism. To be a scavenger an animal must feed on the more simple organic compounds produced by the organisms of decay. This is not a simple feeding behavior but a derived form of feeding, for a scavenger must be able to feed on many compounds which are poisonous to most organisms. This tolerance to poisons is a specialized behavior and the organism with such behavior should not be considered primitive.

There are very few observations which support the common idea that the Staphylinidae are scavengers. In most cases the food of the staphylinids has undoubtedly been confused with the habitat in which they are found. This conception is clearly shown by references from the more general entomological texts. Kellog (14:260) sums up this feeling by saying, "They are mostly carrion feeders and with the Silphidae are almost sure to be found whenever a mass of decaying flesh or excrementitious matter exposed on the ground is turned over. Among the smaller staphylinids are numerous predaceous species." The opinion of other authors can be best shown by quotations.

Folsom (22:236): "Staphylinidae are carrion beetles." Comstock (24:489): "As these insects feed upon decaying animal and vegetable matter, they should be classed as beneficial." Imms (24:480): "Members of the family abound where there is decaying organic matter, including dung and dead animals, while many are predaceous. More

than 300 species are known to be myrmecophilous . . . ." Tillyard (26:209): "Larvae active, caraboid, scavengers of decaying animal or vegetable matter; . . . . These beetles are mostly small to medium in size, active, ground-scavenging." Lintner (82:187): "Their food consists largely of decaying animal and vegetable matter, rendering them very useful as scavengers. Some of the species attack and destroy other living insects, and are so cannibalistic as to prey upon their own species. Others are true parasites, and find their food in the larvae of ant's nests, in the nests of wasps, in beetles, and from recent observations, and an increased knowledge of their habits—in many more insects than are now suspected."

See also Sharp (01:225); Sanderson and Jackson (12:143); Smith (99:203); Smith (06:172); Smith (09:237).

Some of the more specialized literature also contains this same general conception as to the food of the rove-beetles.

Fabre (22:49) considers the food of *Creophilus maxillosus* (L.) to be decaying flesh, but states that the larval forms of *Staphylinus olens* Mull. will kill each other when confined, and as food he offered them beetle larvae and crushed snails. Weiss (22:159) is uncertain as to their feeding behavior for he says, "*The Staphylinidae* were placed in this group also, (Saprophaga) although this family contains members which live in fungi, in animal and vegetable decay, in the nests of ants and some are predatory." Herms (07:48) lists *Creophilus maxillosus* (L.) variety *villosus* (Grav.) as a scavenger. Jacques (15:526) places three staphylinids, *Ontholestes* (*Leistotrophus*) *cingulatus* (Grav.), *Creophilus villosus* (Grav.) and *Philonthus aeneus* (Rossi) in his list of twenty-one Coleoptera associated with and apparently feeding on decaying fish. McAtee (27:180): "The staphylinid larvae found in one nest must have been scavengers also; they died without reaching maturity, so were not identified; it may be remarked, however, that a European staphylinid (*Microglossa*) is a regular inhabitant of bird's nests"

See also Gibson (04:77-79); Lintner (88:430 acc. Lintner 89:303); Hamilton (89:107); Riley (70:128) and Riley (70:245).

In all the preceding references the fact that staphylinids are always found in and near decaying organic matter, is the background for the statements that they are scavengers. Those that mention predacious behaviors mention them as exceptions and not as the rule.

A few authors have cited observations in their attempts to sum up the scavenger tendencies of the rove beetles.

In his discussion of the cave inhabitating *Emplenota lucifuga* Casey, Banta (07:30) says, "It is essentially a scavenger. It has been seen feeding at the carcass of a dead mouse, upon a myriapod, and abundantly upon the bait mentioned above (a bait of decaying beef and cheese). It probably feeds also on decaying vegetable matter. It was more attracted by beef than by other bait." It is difficult to estimate the detail of the above observations. One can not be sure as to the actual food of a small beetle when it is found in a certain habitat, and it would be very easy to assume that they were feeding on the ground substance when in reality they were searching for the minute

animal life which was to be found in the decaying bait. Rau (22:48) tells of the feeding of *Creophilus villosus* (Grav.): "They were kept for some time in a deep glass jar half filled with earth, and were fed on cooked and raw meat. Often they would crawl on top of the provender but seemed very wary; a slight lifting of the lid would cause them to scamper under cover. When a tiny pool of juice had accumulated on the side of the dead mouse which we served to them, the beetles were seen to actually drink this up. A small dead garter snake was at another time inserted. At a bruised spot on the side, five of these beetles soon gnawed out a hole three-fourths of an inch in length, and another place twice as large in the middle of the snake. Cooked beef was only sparingly nibbled at, but when no raw food was given they ate enough of the cooked meat to sustain life. They lived thus from April 24 to about May 18. Whether their death then was natural, or due to their artificial environment, I know not."

An explanation of the drinking of the juice of the mouse is not easy. It is possible that the juice was taken as a source of water but even if that were the case the presence of broken down organic material in the water would necessitate a tolerance to such products which is characteristic of scavengers. This observation would lead one to believe that they would eat decaying material when fresh food was not available. The second part of the paragraph repudiates the impression given in the first part. The snake had undoubtedly not commenced to decay and in consequence was not different from the food of a typically predacious animal. The beetles would eat cooked beef but preferred meat that was uncooked which would be the behavior of a predacious animal. It is important to note that Fabre (22:49) also records a similiar behavior in the feeding of *Creophilus maxillosus* (L.), a very closely related European species of *Creophilus*. He says,

"She alights, coils her belly, opens her pinchers and dives impetuously into the Mole's fur. Then, with her powerful nippers, she punctures the skin, now blue and distended by gases. The sanies oozes out. The glutton greedily eats her fill; and that is all. Soon she departs, as suddenly as she came."

The small number of direct observations of staphylinids feeding on decaying matter does not warrant the conclusion that they are scavengers.

As Predators. The observations of true predatism when removed from the shadow of the assumed interpretation, are very complete and convince one of the general predacious behavior of the Staphylinidae. In the following pages I will quote

these observations in as brief form as possible, sometimes with and more often without comment.

A pleasing description of the feeding behavior of a staphylinid (probably *Staphylinus maculosus* Grav.) and also a good picture of one of these beetles poised for an attack upon a fly, is given by Howes (19:22). He says,

"Other animals are attracted by the odor of decay and from far and near they come to seek the cause. Some to their advantage, others to their detriment, for a cannibal lies in wait for them.

"It is a powerful animal, slender and supple-bodied, with a coat of glossy bronze velvet. It is perhaps the most active of all the weird creatures that we have come to know, moving like a flash in response to stimulae. It could not exist where patience is a necessity, at least one is so impressed upon observing it.

"There are many tunnels twisting into the carrion, excavated by other creatures, and one of these the cannibal selects for its abode, until the flesh becomes too dry to act as lure. In this grewsome cave the creature rests, its eyes roving and its whole body ready to spring at an instant's notice, which it does upon all who venture within its range. Indeed we have found a veritable dragon in this creature so fiery and ready for battle. Its prey is helpless before the onslaught and its teeth sink easily through armor.

Leaping upon the back of its victim, the dragon tears deep into its body, grinding flesh and skeleton, sucking every drop of blood until the broken creature curls, dry like a leaf. In a few seconds the unlucky one has disappeared before our eyes. A minute ago we saw a living creature come to the carrion to stay its appetite. Next we hear a crunching noise and saw a splash of blood. Now there is nothing but the retreating cannibal and we gaze dumbfounded at the spot where the scene was enacted."

In their review of the early literature on the parasites and predators of the Gipsy and Brown-tailed moth, Howard and Fiske (12:18) tell of two early applications of rove beetles as predacious controls of other insects. And on page 39 of the same paper in their comments on the work of George Compere they say:

"Mr. Compere has collected many beneficial species attacking many different injurious insects. . . . . In Brazil he succeeded in finding an ichneumon fly and a staphylinid beetle feeding upon fruit fly larvae. He collected some numbers and carried them to Australia in living condition, prematurely reporting success. The fruit fly is a pest in South Africa, and following the announcement of Compere's importations Claude Fuller and C. P. Lounsbury proceeded from Africa to Brazil to get some parasites. The result of this journey was discouraging. They did not find the predatory staphylinid, ..." (The fruit fly is *Ceratilus capitata* Wied.).

Kirby and Spence (46:253) give rove beetles as examples of true predators. Wardle and Buckle (23:47) also hold this view saying, "The chief predators upon insects are either insects themselves—particularly the Coleopterous families Carabidae, Staphylinidae and Coccinellidae, . . .". In order to substantiate a similar view Essig (26:383) quotes Davis 15 and Quayle 12. Davis (15:150) reports *Creophilus villosus* (Grav.) feeding on fly larvae around carrion. In his discussion on the food habits of certain dung and carrion beetles Clark (95:61)

divides them into three classes. In his third class he places *Staphylinus patruelis, mysticus, fossator, Ontholestes cingulatus,* and *Philonthus* sp. as those beetles which feed almost exclusively on larvae. Brooks (06:22): "On July 29th, a rovebeetle, *Philonthus brunneus,* was observed under a grape vine with a curculio larva in its jaws."

Schaup (79:30): "I fed a larva of Staph. maculosus with a caterpillar about four times larger than itself, the larva seized the caterpillar at the neck and was beaten around the cage terribly by the jerkings and convulsions of the latter, but kept on, and sucked the contents of it." Frost (16:383) in his notes on Maine Coleoptera says of *Ontholestes cingulatus* (Grav.): "I soon found them stalking the green flies that infested the manure in numbers. Several of the beetles were observed with flies in their jaws, ... They have also been seen feeding on adult *Aphodius fimetarius.*"

In his discussion on the natural control of *Ips pini* Say, Clemens (16:296) says, "Predaceous staphylinid larvae and adults, *Xantholinus cephalus* Serv. *and Quedius laevigatus* Gyll., are common in the burrows and no doubt devour eggs and larvae."

A number of adult rove beetles have been found by various investigators associated with and feeding on the cabbage root maggot Barnard (80:199) in his description of the feeding behavior of *Aleochara anthomyae* Spr., says, "The beetles are often seen running from one young cabbage to another, or entering holes, but more commonly close about the stalk. Half of our young cabbages here, last year and this have been killed by the maggots and now on pulling up an infested stalk, these beetles often come out, sometimes several from one plant To test their habits, I put a maggot in a bottle with them. When hungry a single one alone will attack a full-sized maggot, tearing open its sides and feasting upon it. I have seen five of them like a pack of wolves cling to and tear, a writhing maggot, killing it quickly. They are wonderfully active, and promise to be the best enemy against the fly which has ruined so many crops here."

Schoene (16:150), "In our work at Geneva we have frequently bred staphylinids . . . . and have found them in such number about injured cabbage and radish plants as to leave no doubt as to the nature of their activities or their importance. In addition to *bipustulata* we have occasionally bred *Philonthus nigritulus,* and *Homalota sordida.* We have taken the following species near infested cabbages: *Tachyporus jocosus* an unknown *Aleochara* sp. allied to *athata, Oxytelus nitidalus* and *Staphylinus badipes.*"

Contrasted to these cases that are on the border line between parasitism and predatism we have a number of observations in which there is little doubt as to the behavior involved. They are as follows:

Chapin (15:157-158) telling of the feeding of *Xantholinus cephalus* Say, says, "Very little difficulty was experienced, the larvae feeding readily on small maggots, such as are found under decaying bark." Mank (23:244) is not sure as to how the larvae eat the victims but seems to feel that they suck the juices from the body of the prey. She was never able to observe the feeding behaviors as the light seemed to disturb the larvae so that they would not eat while the covers of the cultures were removed. Fly larvae were found that had been attacked by the beetles. She says, "Larvae of muscids and other Diptera were eaten readily" and in two cases she fed cultures entirely on mites.

See also Smith and Hadley (26:41); Fullaway (25:48) reviewed in Rev. App. Ent. Ser. A 14:500; Walcott (22:18); Report Ent.

Soc. Washington, February 10, 1906; Goe (25:238); Richards, in litt., and 1926; Fowler (13:241 acc. Richards in litt.); Foster and Jones (15:52); Mokrzecki 1923 reviewed in Rev. App. Ent. Ser. A 12:105; Munroe 1917 reviewed in Rev. App. Ent. Ser. A 6:115; Coquillet (91:318); Illingsworth (23:272); Gibson and Treherne (16:56); Lintner (82:189); Curtis (60:138); Wadsworth (15:13) and Rau (22:49).

Because of rather complicated rearing methods an accurate check on the amount of food consumed during larval life has seldom been attempted. Quayle (12:511) kept records of the amount of food consumed by the larvae of *Oligota oviformis* Casey. Over periods of twelve or fifteen days the larvae would consume on an average of twenty spiders (small red spiders) per day. He did not succeed in obtaining pupae but felt that he had reared larvae thru most of their normal larval period. During the period he was able to keep larvae alive each would eat from two to three hundred red spiders. Most of the spiders were mature individuals as "they were transferred daily and consequently the eggs and small spiders would be left". Adults ate about ten spiders per day. The maximum life recorded by Quayle was thirty-two days or a total of over three hundred for the period of observation. Adding larval and adult records, a single beetle during its life will consume upwards to six hundred red spiders. This does not give us an accurate quantity of food consumed but it does give us an idea of the amount of food these beetles will consume. Concerning the actual feeding of the larvae he says,

> "With its sharp pointed mandibles the larva punctures the spider usually about the center of the body, and by a pump-like action the body content is sucked up. This is colored red and may be distinctly observed passing from the body of the spider into the alimentary canal of the more or less transparent larva of *Oligota*. As most of the body juices of the spider were absorbed they were spewed back again, and the spider, which had been made transparent by the absorption of the body contents, resumed its normal color and rigidity. This pumping back and forth is repeated two or three times before the mouth parts finally release the victim. Feeding also occurs on the eggs in a similar manner."

I have observed larvae in sixty-nine of my cultures feed on the living food which I placed in the culture box, and many of these larvae were observed feeding on more than one occasion. The sixty-nine larvae belong to the following species: *Ontholestes cingulatus, Staphylinus maculosus, Staphylinus viridanus, Creophilus villosus, Philonthus quadricollis, Philonthus brunneus, Philonthus protervus, Paederus littorarius* and *Gastrolobium bicolor.* Further I have observed either in the laboratory or in the field the feeding behaviors of the adults of *Staphylinus maculosus, Staphylinus violaceus, Staphylinus cinnamopterus, Creophulus villosus, Philonthus cruentatus, Olophrum obtectum* and *Stenus* sp.

Adults fed in confinement as readily as do the larvae. Stenus sp. (two cultures of two each) almost immediately attacked maimed flies which were placed in the cultures. *Philonthus cruentatus* killed and ate flies *(Muscidae* and *Drosophila)* and on May 6, 1926, near Bloomington, Indiana, I captured one individual with a dipteron, one of the *Helomyzidae* in its mandibles which clearly shows that the feeding in the laboratory was natural. *Philonthus* sp. was found in large numbers feeding on fly larvae in dung at Winfield, Kansas. *Creophilus villosus* fed readily on blow fly larvae and pupae which were placed in the culture. At Douglas Lake, Michigan, August 1, 1926, at a carrion trap set by C. H. Martin, he and I observed *Creophilus villosus* eating a large fly larva. *Ontholestes cingulatus* fed on blow fly larvae and pupae, ant larvae and pupae, termites, and *Drosophila.* Mr. H. T. Spieth of this laboratory, while collecting for me at Charlestown, Indiana, saw an *O. cingulatus* capture a fly which was feeding on the sap of a cut maple stump. The beetle darted from some hiding place and captured the fly, one of the *Muscidae,* before it was able to take wing. A second beetle was taken while it was chasing a fly. Both beetles and the fly are in my collection. *Staphylinus maculosus* killed June bugs *(Melolonthinae),* silphid beetles (*Silpha noveboracensis* Forst.), blow fly larvae and pupae, ant larvae and pupae, termites, and *Drosophila.* When placed in a *Drosophila* breeding jar the beetles turned over and over in their efforts to capture all the flies which came near them. In the open they feed on a variety of insects. On May 6, 1926 near Bloomington, Indiana, I found a large *S. maculosus* in a small nest-like cavity under dung, and in this nest there were large numbers of pieces (abdominal segments, elytra, heads, and thoraces) of various *Scarabacidae* common to dung. Whenever more than one adult or larval staphylinid is placed in a culture which is small or which does not contain sufficient food, cannibalism will result. *Staphylinus violaceus* fed readily on termites and *Drosophila. Olophrum obtectum* feed freely on fresh beef, several beetles surrounding the beef and feeding wherever a small bit was exposed.

Staphylinus maculosus is convenient for observation because of its size. One of these beetles easily killed a medium sized moth and ate the abdominal parts. The staphylinid approached cautiously, cat-like, with the tip of the abdomen elevated and the head held close to the ground. The moth was grasped by the tip of its abdomen and during the struggle which ensued, the staphylinid, in a bull-dog like manner bit nearer and nearer to the thorax. At the first opportunity the moth was securely grasped by the thorax and soon crushed. The attack on the June bug was not essentially different but as no vulnerable

point was exposed dorsally the staphylinid turned over on its back and grasped the June bug ventrally between the head and thorax. As soon as the June bug was killed the thorax was torn from the abdomen and a large amount of the viscera eaten. If a part of the June bug was moved with a probe the staphylinid would attack again and retain its hold until all movement ceased. One could easily hear the crunch of the mandibles as each onslaught was made on the chitinous shell.

It is not probable that the staphylinids swallow much of the solid portion of their food. In all cases under observation I found no instance in which it appeared that they were actually ingesting the solid substances, but rather they appeared to be extracting the juices and then discarding the more solid parts. I am very certain that the larvae do not ingest the solid food particles. The larva of *Staphylinus maculosus* would take the ant larva, ant pupa or termite and crush it between the mandibles and the clypeo-labral margin while the labium lapped the morsel. When the food began to work out from the mouth parts the larva would push it back with the anterior tarsi. Chewing would continue until the food material had been reduced to a dry pellet. If several termites were placed in the culture at one time the larva would paralyze, by crushing, all near it before beginning to feed. There is very little difference between the methods of feeding of the larvae and adults.

As Parasitoids. There can be no definite line drawn between the behavior of the parasite and the predator. Our only method of measurement is the effect upon the attacked organism, as both parasites and predators live at the expense of others. Organisms which are unmistakably predacious attack and devour their victims. The parasite on the other hand, although it draws its food from another organism, is not immediately fatal to the host. Fatality to the host in a truly parasitic relationship is not caused by the feeding of the parasite but is caused either by general exhaustion, produced by the withdrawal of the food containing materials or by the actual increase in the number of parasites.

A perfect parasitic relationship is one in which the host organism is not seriously harmed by the presence of the parasite for when the host is killed the parasite must find another host or die. This ideal parasitic adjustment can be effected only in relationships of long standing and those organisms which seem to be parasitic but which quickly kill their hosts, may be considered to have only recently acquired this behavior.

Beginning in 1870 when Sprague published his account of breeding *Baryodma anthomyiae* (Sprague) from the puparia of

the cabbage root maggot (Phorbia brassicae Bouche), down to the present day there has been a feeling that certain of the staphylinids approached a parasitic behavior. Following Sprague's report in 1870, most of the authors who discuss the cabbage root maggot (*Phorbia brassicas* Bouche or any of the closely allied maggots) from an economic standpoint, mention staphylinids as important natural enemies and quite often mention some species of Baryodma as a possible parasite.

A number of these reports are as follows: Barnard (80:199) reports *Baryodma anthomyiae* (Sprague); Lintner (82:188) quotes Sprague (70:300) and Barnard (80:199); Fletcher (86:188); Fletcher (91:164); Fletcher (02:?); Slingerland (94:517-519) quotes from Sprague, Barnard and Fletcher; Washburn (08:206) reports *B. nitida* Grav.; Lowry (15:146) quotes Sprague; Schoene (16:147-150) reports *B. bipustulata* L.; Gibson and Treherne (16:52) reports *B. ontarionis* Casey; Eyer (22:10) cites no definite species; Du Porte (13:?); Paillot (14:?); Severin and Severin (15:?); Smith (22:?); Miles (24:?); Triotzki (25:?); and Zorin (27:?). (The last seven have not been seen by the author but are references taken from reviews in the Rev. of App. Ent. Ser. A).

The taxonomy of this group of staphylinids is highly involved. Leng (20:124-125) considers the American species to belong to the genus *Baryodma* subgenus *Coprachara.* In his 1927 Supplement Leng (27:24) lists *anthomyiae* Sprague as a synonym of *verna* Say which is suspected of being a synonym of *nitida* Grav., and *bipustulata* L. is cited in error for *nitida* Grav. According then, to the Leng Catalogue there are possibly three valid species (*verna* Say *ontarionis* Casey and *nitida* Grav.) in North America which are known to be parasitic on the cabbage root maggot. *Nitida* is known in Europe and it is probably an imported species in this country, coming to us in shipments of root stocks.

Wadsworth (15) reared a number of staphylinids from the puparia of the cabbage root maggot and made observations on their behavior. Most of Wadsworth's specimens were determined by D. Sharp *Baryodma bilineata* Gyll., and a few as *B. nitida* Grav. The eggs of *bilineata* are laid in the soil near plants infected with the maggot. The eggs hatch into typical campodeiform larvae which burrow deeper into the soil and attack the fly puparia. Entrance is made by gnawing a hole in the wall of the puparium which is quickly sealed by a white substance supposed to be the body fluid of the fly pupa. Rarely more than one larva enters a puparium. At the close of the first instar the larva becomes greatly distended and in the second

instar has a decidedly different appearance, the appendages are all reduced and the chitin becomes much thinner. There is no further change during the third instar. The one fly pupa is sufficient food to allow the beetle to complete its development and in *nitida* and *bilineata* Wadsworth found that pupation occurred inside the puparium of the prey. Exit of the adult is made by breaking a new hole in the wall of the puparium.

Reports indicate that the behavior of the other so-called parasites of the cabbage root maggot (see previous references to *nitida, bipustulata, ontarionis* and *anthomyiae*) is very similar to that of *B. bilineata.* Nor is this behavior confined to this group. Scott (16:206) reports *Aleochara algarum Fauv.,* in the puparia of *Orygma luctuosum* Meig.; Scott (20:148-56) *A. algarum* in the puparia of *Coelopa philipes* Hal., and *Fucomyia gravis* Hal.; and (20:156-157) *Homalota breale* Kr., from an undeterminable fly puparium. (A single beetle was found in a tube in which had been placed a fly pupa. The tube was plugged with cotton and was not disturbed until after the beetle was found.) Wadsworth (15:?) cites an instance where *Aleochara lata* was found in a breeding jar containing cocoons of saw flies but as this semiparasitic behavior was not as yet suspected a thorough investigation was not made.

The behavior is slightly different in the case of *Mesochara valida* Lec., (Coquillet 91:318). The beetle larva gnaws its way into the puparium (the syrphid fly *Copestylum marginalium* Say) and remains until just previous to pupation when it emerges and pupates outside the puparium of the fly. These two types of behavior have recently been studied by Kemner (26:133-170). In this work Kemner repeats the work of Wadsworth and obtains similar results. He then goes further and compares the behavior of *bilineata* with *Aleochara curtula* Goeze and *Baryodma intricata* Mannerheim. In the latter forms he finds that instead of the larva remaining in the empty puparium to pupate it emerges and pupates in a nest-like cavity in the earth. (In Europe *bilineata* Gyll., is considered to belong to the genus *Coprochara,* which is considered as a subdivision of *Baryodma* by Leng (20). In comparing the behavior of the three European genera Kemner has compared species of three closely related groups.)

The preceding feeding behaviors show clearly that among the Staphylinidae there is in a number of cases, a trend toward parasitism. In these known cases the apparent host selection and the derived form of the larva during the second and third instars also points toward the development of a parasitic behavior. There has been no experimental work done on the choice of food by these larvae as all the work has begun with the attack on the fly pupa and not upon the larva of the beetle. There is no apparent selection of larval food on the part of the adults for they are near the infected cabbage in order to obtain food for themselves and not to provide food for the larvae. The eggs are deposited in the soil near the infected plants and when they hatch the young beetles must search for their own food. The presence of the beetle larvae near the fly pupae has not necessitated a change in the behavior of the adults which would be the case in a true parasitic behavior. The

predacious tendencies of the beetles is also indicated in the fact that they live inside the puparium instead of inside the body of the host, and there is no period when host and parasite live together without apparent harm to the host, for immediately upon entering the puparium the beetle begins the meal which will allow it to pupate.

These border line behaviors of the staphylinids are in accord with Wheeler's (Wheeler 23:195-196) view that parasitism among the insects is more nearly refined predatism and has its evolutionary origin in predatism. "In some groups of animals symbiotic or mutualistic relations may thus lapse into parasitism, but it seems to me improbable that parasitism among insects has had such an origin. The common and perhaps exclusive source of the phenomenon among these highly specialized organisms is predatism. In fact, the most typical of the parasitic insects are really refined predators, which usually, on growing to their full stature, kill the hosts they have been carefully sparing, and one might say, using as food-getting instruments. Since this is not exactly the form of parasitism exhibited by other organisms, such as the tape-worms, certain barnacles, and bacteria, I prefer to call it 'parasitoidism'." (Wheeler 23:195-196).

Parasitoidism is further discussed by Root (24:487) as follows, "Now when any entomologist except a medical entomologist refers to parasitic insects, it is extremely likely that he is thinking, not of the true parasites, but of the *Parastoid parasites.* Most of the truly parasitic insects parasitize vertebrates. The tiny 'bee-louse', a degenerate fly which is a true external parasite of drone honey-bees, is one of the few known exceptions to this rule. In nearly every case, then, the insects which parasitize other insects are of the parasitoid group. When an economic entomologist, for example, speaks of the possibility of controlling some insect pest by means of its parasites, he is referring to these parasitoid parasites.

"These parasitoid species differ from the true parasites in several ways. In the first place, the parasitoid condition is always one of temporary parasitism. In the insects, a parasitoid species is always parasitic as a larva and free-living as an adult. Further, the parasitism of a host individual by one or more parasitoid larvae almost invariably results in the death of the host individual. The parasitoid condition is, in fact, one of a long-drawn-out predaceous existence. As Wheeler has said, the so-called parasitic *Hymenoptera* are really very economical predators. The female deposits her eggs or larvae on or within the body of some other insect, larval or adult. The parasitoid larvae then starts in to eat up its host *in toto,* but it cannily begins with the fat-body and other tissues not essential to the life and growth of the host. Thus the host may continue for a long time to live and grow apparently normally, and may even reach maturity and pupate, in the case of a larval host. But the end is certain, though delayed. Sooner or later, when the non-essential tissues are all consumed and the appetite of the parasitoid larva whetted thereby, the essential tissues as well are devoured, until nothing remains of the host but an empty skin, which the parasitoid larva often utilizes as a convenient and protected place for its own pupation."

Among the staphylinids the so-called parasitic behavior fulfills all the above conditions and should be termed parasitoidism. It is evident that the behavior in the family is a very recent derivative from true predatism and adds strength to the conclusion that the family is primarily predacious.

As Social Parasites. The large number of staphylinids which live as guests of the ants and termites are primarily predacious in their behavior. While they consume quantities of food dropped by the adult ants, food destined for colony consumption and regurgitated material, they also eat many eggs, larvae and wounded or isolated workers. The depredations of *Lomechusa strumosa* on the larvae *Formica sanguinea* led Wasman (see Donisthorpe 13:320-321) to assume that the presence of pseudogymes in a nest indicated that the colony was or had been parasitized by *Lomechusa* even if the beetles could not be found. The pseudogymes do not appear immediately in parasitized colonies and may never appear. It is thought that if the *Lomechusa* become so plentiful as to deplete the number of worker larvae, the workers will change the food of many of the sexed individuals in an attempt to produce more workers. The persecuted guests depend on the food they can steal and on the number of isolated or injured individuals they can waylay and kill. The scent glands are well developed in these species and are effectively used in a number of cases, (see Wheeler 10:382, Beebe 19:459, and Donisthorpe 13:322). The tolerated guests, while they steal regurgitated food and other materials, feed on large amounts of living material such as mites and ant eggs.

As Plant Feeders. There are a few well founded reports which show that staphylinids on occasion do damage to plants. The observations were in most cases concerned with the damage so that we have little or no information as to the food value derived by the insect. It is to be noted that in both cases where specific damage has been recorded the insects belong to the subfamily *Omaliinae* but as yet the work is too meager to allow generalizations.

The instances of plant injury caused by staphylinids are as follows:

Chittenden (15:2): The beetles (*Apocellus spaericollis* Say) enter violets, which during part or all of their blooming period rest on the ground, and cut holes in the flowers. A number of the beetles were isolated with perfect flowers so that there seems to be little doubt that the injury was caused by them. Scheerpeltz (27:1-9) reports that *Anthobium ophthalmicus* Pay., is injurious to the blossoms of *Rhododendron hirsutum*. The beetles gnaw holes in the base of the corolla causing the inflorescence to wilt, turn brown and fall before the fruit is formed.

The genus *Anthobium* contains several species in this country which are found associated with blossoms but no damage has been reported (Blatchley 10:481). Scheerpeltz apparently believes that *A. opthalmicus* is phytophagous and says that they have been considered pollen feeders by other authors. There have been a few reports of injury to cabbage and root crops. The beetles which usually feed on the root maggots occasionally gnaw at the tender roots (Lintner 82:189).

The literature of the insects associated with fungi contains numerous references to staphylinids. Weiss and West (22:198) report *Philonthus cyanipennis* Fab., and *Tachinus fimbriatus* Grav., feeding on *Russula* sp., and *Collybia* sp. Contrary to the above conclusions Richards (26:278-280) in his "Animals Associated with Fungi" lists *Aleochara brunneipennis* Dr., *Atheta xanthoptera* Steph., *Autalia impressa* Ol., *Boletobius pygmaeus* F., *B. trinotatus* Er., *Gyrophaena gentilis* Er., *Philonthus marginatus* F., *Ph. proximus* Dr., *Ph. varians* Pk., *proteinus brachypterus* F., *P. ovalis Steph., Quedius cinctus* Pk., and *Tachinus laticollis* Gr., all as carniverous. Richards further states his position in the discussion of "Pine Stumps and Fungi" by saying, "The animals at the base of the food chain are larvae of small flies and *Collembola.* The staphylinid beetles feed on these but there are no details of their feeding habits."

My own laboratory experiments have not been conclusive. When mated pairs of *Tachinus fimbriatus* Grav., were confined with fleshy fungi for food, it was noted that after several hours there were places on the gills which had been eaten. The beetles soon died but it is difficult to say whether they died for lack of suitable food material or because of old age.

Mating Behaviors

The variation in the accounts of copulation recorded for Staphylinidae is due to the species involved, to incomplete observations and to disturbing conditions which the observer has not taken into account. If two staphylinids are disturbed during copulation, both immediately attempt to escape, one in one direction and the other in the opposite. As the reproductive organs do not free readily, the observer might easily conclude that this end to end position is the normal behavior. This condition is as frequently seen in the field as in the laboratory.

Xambeu (07:115 and 08:70-71) gives a general account of the copulatory behaviors of the genera *Philonthus* and *Staphylinus.* According to him, copulation most readily occurs in the spring. The male seeks out the female and makes the attempts to copulate. The female is more passive and while the male attempts to mount and insert the penis, she makes little or no attempt to escape. The male remains on the back of the female for some time, varying from a few minutes to a number of hours. This is termed by Xambeu the first phase of copulation. At the close of the first phase, the male releases his hold on the back of the female and takes a position which places the two individuals more nearly end to end. This second phase lasts from a

few hours to a day. At the close of the second phase, the copulatory organs are disengaged and the behavior is completed. The behavior of several individuals of *Creophilus villosus* (Grav.) is recorded by Rau (22:47-48). The pairs while mating walked around and even attempted to climb a string. Sometimes individuals above ground tried to mate with those almost covered with earth. An account of copulation in *Alleochara curtula* Goeze is given by Kemner (26:137). The male pushes the fore part of his body under the abdomen of the female and with his own abdomen curved over his back the copulatory organs of the two are brought into contact. Kemner not only calls attention to this exceptional behavior but to this ability of the male to curve his abdomen enough to allow copulation. A very similar behavior is recorded by Donisthorpe (13:320) for *Lomechusa strumosa* F., "The male faces the back of the female, and pushing his head under her body, he raises himself on the tips of the front legs, nearly standing on his head. He bends the body right over his back, to reach the end of the female's body, when she puts her body up to meet his. The posterior part of the male's body opens and clasps that of the female, and coition takes place."

In the laboratory, in my own observations of *Philonthus politus* (L.), the male grasped the female with his mandibles and before he attempted to mount, the penis was extended posteriorly until it was entirely out of the body cavity, then it was bent ventrally thru an angle of almost 160°. As soon as the copulatory organs were in place, the male fell to the side of the female while she struggled to escape. The entire process lasted only a few minutes but was probably disturbed by the light condition of the culture and the presence of an observer. In *Staphylinus maculosus* Grav., the behavior was very similar to that of *Philonthus politus* (L.), except that the process covered a longer period of time. I have taken species of the genus *Stenus* in copula in the field a number of times but have never seen the beginning of the behavior. When found they were always end to end struggling to escape. Occasionally the reproductive organs were so firmly fastened that they were killed in cyanide before they became disengaged.

Oviposition

Xambeu (07:115) has probably based his general account of oviposition on his observations of *Philonthus laminatus* Creutry (reported by Xambeu 98:25 acc. Xambeu 07:129) and *Philonthus speldens* Fabricius (reported by Xambeu 94:1 acc. to Xambeu 07:145). Oviposition (acc. Xambeu) occurs under or in decaying plant or animal material, which is apparently

located by the olfactory sense of the female. Preceding oviposition the female digs a small trench either in the earth or in the decaying substance with the tip of her abdomen. The egg is deposited in the trench and then covered with earth or decaying material. After a short period of rest the behavior is repeated and a second egg is deposited. This second egg is not deposited by the side of the first but nearby. The number of eggs is limited to six or eight.

In her review of Xambeu's report Mank (23:225) has possibly misinterpreted the French for she says, "She digs an oblong trench in the soil or other material with her anal segment and then deposits six to eight eggs in it, one at a time, and covers it all with earth or food." I understand the phrase ". . . . elle pond non loin et toujours sous l'amas nourricier, un deuxiême oeuf dans les mêmes conditions, et continue ainsi jusqu'a ce que de son ovaire il ne reste plus de germes . . . ." to mean that the female deposits nearby and always under the same heap a second egg in the same manner as she deposited the first. This behavior is repeated until the ovaries are exhausted.

Xambeu's complete account is as follows: "Ponte.—A cet effet, si elle ne se trouve déjà sous un cadavre hauté par les vers ou sous des matieres putrescibles déjà habitees, elle vole a la recherche de la nourrieture destinée a sa future lignée; a l'aide de son sens olfactique, si subtil, elle a bientôt fait de trouver le milieu convenable;—la provende nourriciere ainsi découverte, elle gagne le dessous de ses amas, s'enfonce peu profondément sous la croûte des déjections ou sous le sol rendu fraisé par l'écoulemement de la sanie des cadavres ou des dégagements azotes des matières vegetales;—de l'extrémité de son segment anal elle creuse un petit trou qu'elle façonne en forme de loge oblongue appropiée au volume de globule à placer, dépose un premier oeuf, dont elle dissimule la place en grattant avec ses pattes le sol environnant; après un bien court repos, elle pond non loin et toujours sous l' amas nourricier, un deuxième oeuf dans les mêmes conditions, et continue ainsi jusqu'a ce que de son ovaire il ne reste plus de germes; -le nombre d'oeufs pondus par chaque femelle est restreint, six a huit, ils sont toujours gros et hors de proportion avec la taille de la femelle;—fatiquée par ce rude labeur, cette mère à l'avance sacrifiée, gagne un coin du terrain où elle terminera péniblement ses jours, à moins qu'un affamé ne vienne lui disputer les quelgues moments qui lui restent encore à vivre."

I have not observed the actual behavior of oviposition in the field or in the laboratory but from the observations made on *Staphylinus maculosus*, *Tachinus fimbriatus* and *Ontholestes cingulatus* which oviposited in the laboratory I have the following note. A pair of *Staphylinus maculosus* taken near carrion at Bloomington, Indiana, 4.15.27, were placed the same day in a small fruit jar which was partly filled with earth. Copulation took place almost immediately. On April 28th, I found two eggs and one egg shell, on May 2nd, five eggs and one egg shell, on May 4th, one egg, and on May 6th, two eggs making a total

of twelve eggs during a period of twenty-two days. From the time the first eggs were found until oviposition stopped there was an average of one egg per day. In no case did it appear as if more than one egg had been deposited in the same place. Most of the eggs were below the surface of the soil and it is possible that the eggs were placed in a group and then disturbed by the digging of the adults. However, the adults confined their diggings to the material near the sides of the jar and left the greater portion of the culture area untouched. This was true with every inspection the culture received. When the eggs were discovered they were found in localities which apparently had not been molested by the adult inhabitants. This particular form (*S. maculosus*) has an egg which is so large that it stretches the imagination to believe that many ripe eggs could be contained in the abdomen at one time. Again, it seems logical that if the eggs were deposited in a group, the number of eggs found would not closely correlate with the number of days between checkings. Although the culture data quoted above does not show a checking for every day, yet the average was one egg per day which in itself points to the conclusion that the eggs were laid singly. These few facts have formed the principal evidence for my support of Xambeu's account as I have interpreted it.

In the case of *Staphylinus maculosus,* the female did not die from the effects of oviposition for when food grew scarce in the culture, she killed the male and ate the softer parts. When I killed her for preservation she was as vigorous as when I first collected her.

From what is known of the oviposition and feeding behaviors of the staphylinids it is evident that oviposition behaviors in general are very primitive. The adults are attracted to the habitat in which oviposition occurs not through any change in behavior on their part but through their normal feeding behavior. Oviposition is incidental to the feeding behaviors. Even among the parasitoid staphylinids the adults seek out the root maggots as food material for themselves and not as a source of food for their young. Adults and larvae are to be found in accumulation of decaying organic matter which has been heaped in one place long enough to allow larvae to hatch from eggs deposited there during the feeding of the adults. Only adults are found in habitats of recent origin as they readily migrate from one food source to another.

Xambeu considers spring as the time of most extensive oviposition. This may be true but it is most certainly not the only time of egg laying. A female specimen of *Ontholestes cingulatus* taken at Winona Lake, Indiana, 9.9.26, deposited

four eggs before 9.13.26. *Quedius capucinus*, undoubtedly, oviposits during most of the warmer months or we would not be able to find the larvae so prevalent at all seasons. Also there is no apparent decrease in the number of larvae from mid-summer to late fall for many other species. *Tachinus fimbriatus* oviposited in cultures in late fall.

Pupation

The change from larva to pupa apparently is very rapid. I have never observed the behavior but *Quedius capucinus* in my culture No. 782 was transferred to a new culture as a very sluggish larva. Fifteen minutes later the culture was opened and the pupa was completely formed.

While the larva looses control of the head and thorax before pupation, movement of the abdomen is not lost in the *Staphylininae* for twenty-four to thirty-six hours after pupation. By this time the chitin has hardened and it is doubtful if movement could take place. But I am not sure whether it is the breaking down of the larval abdominal muscles or the hardening of the chitin which first causes the loss of motion. In the subfamilies *Paederinae, Tachyporinae*, and *Omaliinae* the chitin of the pupal case is very thin and flexible and the pupa retains the ability to move the abdomen. The phylogenetic significance of this retention of the ability to move the abdomen is not clear.

Nest Forming Behavior. The larvae of the *Staphylinidae* produce a nest-like cavity during the last few days of larval life and pupation occurs within this cavity. The larva first looses muscular control of its head and thoraces which bend forward in such a way that the prothorax is at right angles with the head and the remainder of the body. During this time the larva turns and twists upon itself until it has crowded all the material near it to form the wall of a small cavity. Microscopic examinations of these so-called nests fail to show that the larva has added any substance to hold the nest together but rather the nest appears to be the mechanical product of the twisting and turning action of the larva.

These nests serve as a protection for the larvae while they are inactive and for the pupae before the chitin dries. It would be more difficult for parasites and predators to reach the inactive larva or pupa in this nest than it would be if no nest was formed. The nests are not necessary to successful pupation, as a large number have pupated on the bare surface of the tin salve boxes which I use for culture containers. Some larvae after the nests were opened for examination threw themselves out of the nests and pupated on the floor of the culture, and quite often the floor of the culture forms one side of the nest. The materials available make little or no difference as *Philonthus*

brunneus may pupate inside a single wheat straw and when it does, no nest is formed. *Quedius capucinus* will pupate and form a nest either in dirt or in old hay debris. *Philonthus tetragenocephalus* pupates above or below the surface of the ground, according to the moisture conditions of the habitat.

Length of Pupal Period. The length of the pupal period varies according to the species and also with temperature and moisture conditions. Either an excess or lack of moisture retards successful development. Low temperatures retard while high temperatures accelerate development.

When a pupa becomes too dry the adult has difficulty in freeing itself of the pupal exuvium and in consequence it will be delayed from several hours to several days. An excess of moisture may cause drowning or allow other factors such as mold to destroy the pupa.

The temperature factor is not readily observed and is apparent only when one rears a large number of a single species under different temperature conditions. The breeding records for *Philonthus cruentatus* Gmel., show a distinct variation in the length of the pupal period which is correlated with temperature conditions. *Table I* shows this variation and also the general temperature conditions prevailing during the pupal stage. *Table II* charts the same data for *Quedius capucinus* and *Philonthus tetragenoccphalus*. The latter table is not as complete but it shows clearly that the variation in length of time, due to temperature, is not confined to a single species.

In *Table I*, the larvae collected during the fall of 1925 were reared inside the building where they were influenced by artificial heat as were those collected during the early spring of 1926. The length of the pupal period of *Philonthus cruentatus* varied from seven to ten days, during late fall and early spring, at Bloomington. The larvae collected at Pendleton, Noblesville, Fishers, and Lapel, Indiana were kept out of doors under as near natural temperature conditions as possible at Winona Lake, Indiana. Winona Lake is in the northern part of the state and the temperature during June there is comparable to early spring at Bloomington. A few of the adults emerged in nine days while most of them required ten days. The collections made at Bass Lake, Tefft, Fowler, Pine Village, and Kern, Indiana, were carried to the extreme southern tip of the state where midsummer conditions prevailed. During this time the pupal period was cut from a maximum of ten days to a minimum of four days. About the middle of July larvae collected in southern Michigan were carried to northern Michigan. These larvae showed a similar variation as did those collected in southern Indiana which were carried to the northen part of the state.

Table 1.

Effect of temperature on the length of the pupal period of Philonthus cruentatus.

Culture Number	Date Collected	Larva Became Inactive	Became Pupa	Pupa Became Black	Became Adult	No. Days as Pupa	Variation in Seasonal Temperature during pupal stage	Locality of collection
151	9.26.25	9.29.25	9.30.25		10. 7.25	7	Late	Bloomington
183	10.10.25	10.13.25	10.15.25		10.23.25	8	fall	Ind.
184	10.10.25	10.14.25	10.15.25		10.24.25	9		"
186	10.10.25	10.13.25	10.14.25		10.24.25	10		"
209A	5.14.26	5.19.26	5.21.26	5.28.26	5.29.26	8		"
211A	5.14.26	5.26.26	5.28.26		6. 3.26	6		"
213	5. 6.26	5.19.26	5.21.26	5.28.26	5.29.26	8		"
215	5. 8.26	5.13.26	5.18.26		5.25.26	7		"
217	5. 8.26	5.17.26	5.18.26	6.26.26	5.27.26	9		"
223	5.14.26	5.20.26	5.23.26		5.29.26	6	Spring	"
228	5.14.26	5.28.26	5.30.26	6. 5.26	6. 7.26	8	at	"
229	5.14.26	5.17.26	5.19.26	5.27.26	5.28.26	9	Bloomington	"
232	5.14.26	5.26.26	5.27.26	6. 1.26	6. 3.26	7	Ind.	"
233	5.14.26	5.18.26	5.21.26	5.28.26	5.29.26	8		"
234	5.14.26	5.26.26	5.28.26	6. 1.26	6. 3.26	6		"
240	5.14.26	5.23.26	5.26.26		5.31.26	5		"
243	5.14.26	5.18.26	5.20.26	5.27.26	5.28.26	8		"
249	5.14.26	5.26.26	5.29.26	6. 3.26	6. 5.26	7		"
250	5.14.26	5.27.26	5.29.26	6. 4.26	6. 7.26	9		"
270	6. 9.26	6.13.26	6 14.26	6.24.26	6.24.26	10		Pendelton
271	6. 9.26	6.16.26	6 17.26	6.26.26	6.27.26	10		Ind.
272	6. 9.26		6 16.26	6.25.26	6.26.26	10		"
274	6. 9.26		6.16.26	6.25.26	6.26.26	10	Spring	"
280	6. 9.26		6.16.26	6.25.26	6.26.26	10	at	"
285	6.10.26	6.13.26	6.16.26	6.24.26	6.25.26	9	Winona	Noblesville
287	6.10.26	6.13.26	6.16.26	6.25.26	6.26.26	10	Lake	Ind.
288	6.10.26	6.23.26	6.16.26	6.25.26	6.26.26	10	Ind.	Noblesville
291	6.10.26	6.16.26	6.20.26	6.28.26	6.29.26	9		Fishers
292	6.10.26	6.13.26	6.16.26	6.25.26	6.26.26	10		Ind.
293	6.10.26	6.16.26	6.17.26	6.25.26	6.27.26	10		"
298	6.10.26		6.16.26	6.25.26	6.26.26	10		Lapel
301	6.10.26	6.16.26	6 18.26	6.27.26	6.28.26	9		Ind.
304	6.10.26	6.13.26	6.16.26	6.25.26	6.26.26	10		"
305	6.10.26	6.13.26	6.16.26	6.25.26	6.26.26	10		"
307	6.10.26	6.16.26	6.17.26	6.26.26	6.27.26	10		"
360	6.24.26		6.30.26		7. 4.26	4		Bass Lake
364	6.24.26	6.29.26	6.30.26		7. 4.26	4		Ind.
365	6.24.26		6.30.26	7. 4.26	7. 5.26	5		Tefft
366	6.24.26	6.30.26	7. 1.26	7. 5.26	7. 6.26	5		Ind.
367	6.24.26		6.30.26	7. 4.26	7. 5.26	5		"
370	6.24.26		6.30.26	7. 4.26	7. 5.26	5	Mid-	"
377	6.24.26		6.30.26		7. 4.26	4	Summer	Fowler
382	6.24.26		6.30.26		7. 5.26	5	Southern	Ind.
383	6.24.26		7. 2.26	7. 6.26	7. 7.26	5	Indiana	"
385	6.24.26	7. 2.26	7. 4.26	7. 7.26	7. 8.26	4		"
387	6.24.26	6.30.26	7. 1.26	7. 5.26	7. 6.26	5		"
389	6.24.26		6.30.26		7. 4.26	4		"
390	6.24.26	6.29.26	7. 1.26	7. 5.26	7. 6.26	5		"
391	6.24.26	6.30.26	7. 1.26	7. 5.26	7. 6.26	5		"
395	6.25.26	6.30.26	7 1.26	7. 4.26	7. 5.26	4		Pine Village
397	6.25.26	6.30.26	7. 1.26	7. 6.26	7. 7.26	6		Ind.
398	6.25.26	6.27.26	6 30.26		7. 4.26	4		Kern, Ind.
399	6.25.26		6 30.26	7. 4.26	7. 5.26	5		"
403	6.25.26	6.27.26	6 30.26	7. 4.26	7. 5.26	5		"
478	7.17.26	7.22.26	7 23.26	7.31.26	8. 1.26	9		Grand Haven
483	7.23.26		7.29.26	8. 5.26	8. 6.26	8		Mich.
488	7.23.26	7.29.26	7.30.26	8. 5.26	8. 6.26	7		Manton, Mich.
490	7.23.26		8. 4.26		8.11.26	7		"
491	7.23.26	7.29.26	7.30.26		8. 6.26	7	Northern	"
520	7.30.26	8. 5.26	8. 7.26		8.15.26	8	Michigan	Douglas Lake, Mich.

Table 2.

Effect of temperature on the length of the pupal period.

Culture Number	Date Collected	Larva Became inactive	Became Pupa	Pupa Became Black	Became Adult	No. Days as Pupa	Variation in Seasonal Temperature during pupal stage	Location of collection
			Quedius capucinus					
685	2. 5.27		2.17.27	3. 1.27	3. 2.27	16		Bloomington
686	2. 5.27		2.17.27	3. 1.27	3. 2.27	16		Ind.
688	2. 5.27	2.17.27	2.18.27	3. 1.27	3. 3.27	16	Mid-	"
689	2. 5.27	2.17.27	2.18.27	3. 1.27	3. 3.27	16	Winter	"
691	2. 5.27		2.17.27	3. 1.27	3. 3.27	17	reared	"
692	2. 5.27		2.17.27		3. 1.27	15	inside.	"
693	2. 5.27		2.17.27	3. 1.27	3. 2.27	16		"
705	3.10.27	3.19.27	3.21.27	3.31.27	4. 3.27	13		"
707	3.10.27	3.23.27	3.25.27	4. 3.27	4. 5.27	11		"
729	3.13.27	3.19.27	3.23.27		4. 3.27	11		"
739	4. 3.27		4.11.27		4.21.27	10		"
739A	4. 3.27		4.11.27		4.21.27	10	early	"
739B	4. 3.27		4.11.27		4.23.27	12		"
740	4. 3.27		4. 7.27	4.18.27	4.20.27	13		Char'estown
742	4. 3.27	4. 7.27	4. 9.27		4.21.27	12	spring	Ind.
745	4. 3.27	4. 9.27	4.13.27	4.23.27	4.25.27	12		"
747	4. 3.27		4.14.27		4.26.27	11		"
748	4. 3.27	4. 9.27	4.11.27		4.21.27	10	at	"
749	4. 3.27	4. 5.27	4. 7.27	4.18.27	4.20.27	13		"
750	4. 3.27	4. 5.27	4. 7.27	4.18.27	4.20.27	13		"
752	4. 3.27	4.11.27	4.13.27	4.23.27	4.25.27	12	Bloomington	"
753	4. 3.27		4. 7.27	4.18.27	4.20.27	13	Ind.	"
754	4. 3.27	4. 9.27	4.11.27	4.21.27	4.22.27	11		"
755	4. 3.27		4. 7.27	4.18.27	4.20.27	13		"
756	4. 3.27	4. 7.27	4. 9.27		4.21.27	12		"
757	4. 3.27	4. 9.27	4.13.27	4.23.27	4.25.27	12		"
759	4. 3.27		4. 7.27	4.18.27	4.20.27	13		"
761	4. 3.27	4. 9.27	4.11.27	4.21.27	4.23.27	12		"
762	4. 3.27		4. 7.27	4.18.27	4.20.27	13		"
763	4. 3.27	4.11.27	4.14.27	4.21.27	4.23.27	9		"
758	4. 3.27		4. 7.27	4.18.27	4.20.27	13		"
764	4. 3.27	4. 9.27	4.11.27	4.21.27	4.22.27	11		"
765	4. 3.27	4. 7.27	4. 9.27	4.18.27	4.20.27	11		"
766	4. 3.27	4. 7.27	4. 9.27	4.18.27	4.20.27	11		"
767	4. 3.27	4. 7.27	4. 9.27	4.20.27		11		"
769	4. 3.27	4.13.27	4.14.27	4.23.27	4.25.27	11		"
770	4. 3.27		4.11.27	4.21.27	4.23.27	12		"
771	4. 3.27		4. 7.27	4.18.27	4.20.27	13		"
772	4. 3.27		4. 7.27	4.18.27	4.20.27	13		"
775	4. 3.27		4. 5.27	4.16.27	4.18.27	13		"
779	4. 9.27		4.18.27	4.27.27	4.29.27	11		Bloomington
780	4. 2.27		4.18.27	4.27.27	4.29.27	11		Ind.
782	4.25.27		4.25.27	5. 6.27	5. 8.27	13		"
785	4.24.27		4.25.27		5. 8.27	13		"
788	4.24.27		4.26.27		5. 8.27	12		"
806	4.25.27		4.27.27		5. 9.27	12		"
807	4.24.27		4.27.27		5. 9.27	12		"
808	4.24.27		4.27.27		5. 9.27	12		"
810	4.28.27		4.29.27		5.10.27	11		"
			Philonthus tetragenocephalus Notman.					
161	9.26.25	10. 1.25	10. 2.25		10.14.25	2		Bloomington, Ind.
476	7.19.26	7.23.26	7.28.26	8. 5.26	8. 6.26	9	Note	Gr. Haven, Mich.
550	8.24.26	8.29.26	8.31.26	9. 8.26	8.10.26	10	The date that	Winona Lake, Ind.
560	8.24.26	8.29.26	9. 2.26		9.10.26	12	the pupa be-	"
562	8.24.26		8.14.26		9.22.26	8	came an adult.	"
886	8. 9.27	8.13.27	8.15.27		8.22.27	7	The variation in	Winfield, Kans.
901	8. 9.27	8.13.27	8.15.27		8.22.27	7	this species is	"
909	8.13.27	8.16.27	8.18.27	8.24.27	8.27.27	9	not so marked.	Springer, Okla.
912	8.13.27	8.18.27	8.20.27	8.27.27	8.29.27	9	In general the	"
914	8.13.27	8.16.27	8.18.27		8.27.27	9	earlier the date	"
915	8.13.27	8.18.27	8.20.27	8.27.27	8.29.27	9	the shorter the	"
924	8.17.27	8.20.27	8.22.27		9. 1.27	10	pupal period.	Winfield, Kans.
925	8.17.27	8.18.27	8.20.27	8.29.27	9. 1.27	12		"
926	8.17.27	8.22.27	8.24.27		9. 1.27	8		"
930	8.17.27		8.27.27		9. 4.27	8		"
931	8.17.27	8.18.27	8.20.27	8.27.27	8.29.27	9		"
933	8.17.27	8.24.27	8.27.27		9. 4.27	8		"
934	8.17.27	8.24.27	8.27.27		9. 4.27	8		"
935	8.17.27	8.22.27	8.24.27	9. 1.27	9. 4.27	11		"
937	8.17.27	8.22.27	8.24.27		9. 1.27	8		"
941	8.17.27	8.22.27	8.24.27	9. 1.27	9. 4.27	11		"
942	8.17.27		8.22.27		9. 1.27	10		"
957	8.19.27	8.22.27	8.24.27	9. 1.27	9. 4.27	11		"
961	8.19.27		8.20.27	8.27.27	8.29.27	9		"

Conclusions

1. Predatism is the prevailing type of feeding behavior in the family.

2. The reported cases of parasitism within the family are typically parasitoid behaviors and support the contention that the group is primarily predacious.

3. The feeding behavior of those staphylinids found in the nests of social insects clearly point to the predacious nature of the family.

4. Scavengerism is only occasionally practiced. The general supposition that the beetles are scavengers is due to confusion of the habitat with the actual food of the staphylinids.

5. Phytophagus behaviors are apparently rare among these insects and are so imperfectly known that generalizations can not be made.

6. The length of the pupal period varies inversely with the temperatures. High temperatures shorten while low temperatures lengthen the pupal period.

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